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# CAREERS IN ENGINEERING

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# CAREERS IN ENGINEERING

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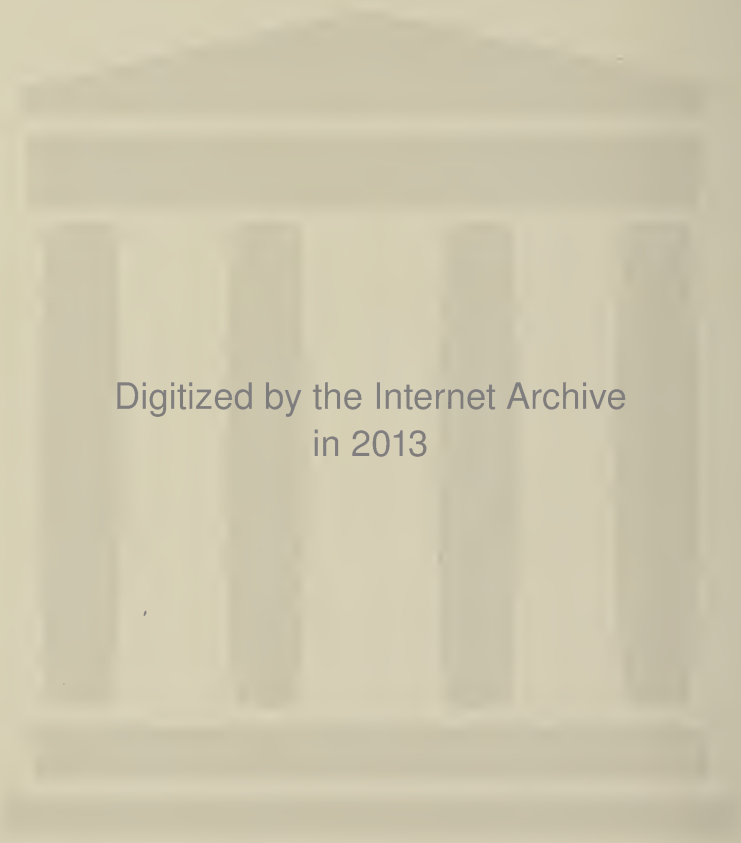
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# I

# CHOOSE YOUR CAREER CAREFULLY

# I

# CHOOSE YOUR CAREER CAREFULLY

Have you made up your mind that engineering is the career for you? Or did well-meaning friends make it sound glamorous to you?

Too many people tackle the problem of picking their career by putting the cart before the horse — they decide to enter a certain field of work, and then try to change their personality and interests to fit that certain field. It should be the other way around. They should choose the field of work that fits them.

It doesn't matter whether your mind is already made up or whether you are just hunting for some ideas. You should look seriously at the problem of picking out a career that fits you.

For instance, how can you be pretty sure you'll make a good engineer? How can you be pretty sure that law or medicine, say, wouldn't be better suited to you? It's a hard thing to figure out because there are so many careers you can choose from, but you have to choose — and not only that; you have to choose carefully and intelligently. It's your life, after all, and you want to live as happy a life as possible.

Of course, some people spend all their lives sitting on the fence of indecision, but their lives are usually pretty useless to everyone — most of all to themselves. If you are to live a happy and useful life, you have to decide. Even if you make a poor decision, it will be better than sitting on that fence. And the chances are that if you are careful and use your head in deciding, you will make the right choice of a career — and that means that you'll be happy and useful in your life.

What are the steps you should take in deciding on your career?

## 1. List the Careers

Your own personal desires are the things to think about here. What are they? Write them down. Maybe you'll only put down one or two things on your sheet of paper. If that's the case, then you had better look around some more so that you can be sure you haven't overlooked some good possibilities. Read some books and pamphlets about other jobs. Talk with your teachers, your folks, or some successful people you or your folks know. You'll be surprised how your list grows.

*View of a small Betatron. A much larger Betatron is now under construction*

The main thing is to make that list. That list will be a little like your eyes; it will show you the directions you can go.

But, important as your eyes are, they aren't everything. You also have to have arms and legs and a body to get along. You have the directions mapped out. Now you have to figure out which direction to move in.

## 2. Analyze Yourself

In order to analyze your abilities, you have to look at yourself as if you were someone else looking at yourself. It's like looking in the mirror, except that you have to see more than just what you look like — you also have to be able to see how you think and act. Ask yourself these questions:

1. What kind of a personality do I really have?
2. How much can I do, and can't I do, in a physical way?
3. In what things am I smart? Not so smart?

These are the basic questions. You'll probably find that you can ask yourself several questions under each one of these basic ones. The more you can think of to ask yourself, the better. And the more honest you are with yourself, the more chance there is that you'll finally come out with the right choice of a career.

If you want help in analyzing yourself, your school or a nearby college or university may be able to tell you where you can get help. There are organizations who will give you tests, called Vocational Guidance Examinations and Aptitude Tests. These tests are not 100% accurate, but they usually do a pretty good job — probably even better than you, yourself, could do — because they can stand off and look at you impersonally, and they won't kid you in the way that you're likely to kid yourself. If you do seek out this kind of help, though, be sure you pick an organization to do it that is recommended highly by your teachers and by other people you respect.

## 3. Analyze the Careers

The next thing to do is to find out as much as you can about each of the careers you listed. Here's where the library will come in handy, because most libraries have a tremendous amount of information on various careers. And the librarian will be glad to help you find that information — that's her job. Another good way of finding out about the careers you've listed is to talk with the men who are already in those careers. And still another way is to ask for information from universities, colleges, and professional or trade organizations; they

will be glad to tell you anything about a certain job that you want to know.

Remember, you may have to take some of the information you get with a grain of salt. For instance, one of the books you read may tell you to forget about one career you had in mind because it is overcrowded. You should certainly consider that fact, but you should also think that maybe, by the time you get out of school, that same career

*Pottery Laboratory — Forming Ceramic Products by Jiggering and Casting in Plastic Molds*

may no longer be overcrowded. In other words, keep your wits about you while you are getting all this information. Don't give up on a career you're analyzing until you have tried to see all sides of the question.

In order to help you analyze your list of careers, here's a check-list of things to consider. Of course, you may find that you don't have to pay any attention to some of these things. Or you may find that you want to consider some things that aren't on this check-list. This is merely to guide you:

1. *What kind of jobs does this career have in it?*
   Usually each career such as engineering, agriculture, journalism, etc., has many different kinds of jobs in it. Later on one method of breaking down a career into its various jobs is shown for engineering.

2. *How much and what kind of education must I have to get in it?*
   This is an important question to answer because indirectly it will tell you exactly what kind of skills you need to develop in order to enter a certain career.
3. *What kind of people will I be working with?*
   This will give you a pretty good picture of your chances of being happy in this career. Are the people who work in it the kind of people you want to be friends with the rest of your life?
4. *What companies have jobs in this career?*
   Usually any given career is made up of jobs in many different companies, and different kinds of companies.
5. *How crowded is the field?*
6. *How does this career rate with other people?*
   You shouldn't let the answer to this one count too much. For instance, people generally look down a little bit at the local garbage collector, but they couldn't get along very well without his service.
7. *How much does it pay to start?*

Notice that the answer to the first question on the check-list tells you what different jobs this career offers. Remember to apply the rest of the questions to *each* of the jobs you come up with after answering question number one.

*The Radio Laboratory for studying, testing, and making measurements on Transmitters and Receivers*

*The Dynamometer Car, used for testing the performance of locomotives while pulling a train*

## 4. Choose the Best Career for You

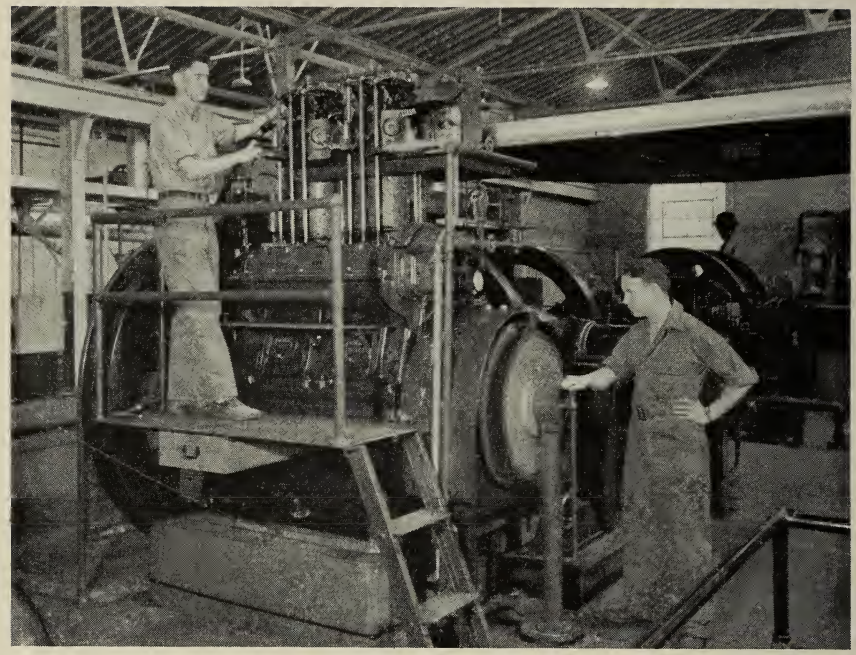
The last thing you have to do in choosing your career is to match what you found out about yourself with what you found out about the careers you had in mind. It isn't very hard to do:

. . . Suppose your self-analysis (No. 2) shows that you will not be able to afford to get any more than a Bachelor's degree, while your career-analysis (No. 3) shows that a career you're thinking about requires a Master's degree. The two analyses you've made don't match. And there's one point against your thinking about that career.

. . . Suppose your self-analysis shows that you like to work with people, and your career-analysis shows that a career you're thinking about calls for people who want to work with others. The two analyses match, this time. And here's one point in favor of your thinking about that career.

Now it may turn out after all this analyzing that you'll find you don't seem to fit 100% into any career, and you fit into several different ones only partly. If this happens it shouldn't discourage you because it's exactly what should happen. It means that you'll be pretty sure of succeeding in any one of these careers.

Don't expect to make this important decision — the choice of your career — overnight. As you can see, there is a lot of thinking called for; it will take a lot of time. The first things to do are to make a list of careers and to analyze yourself. If you do these during your junior and senior years in high school, you'll have a good start on the problem of choosing your career. Usually you won't be specializing in



*Vertical Diesel Engine*

college until your junior year there, so there will be time for all your thoughts to fit into some kind of a pattern that makes sense.

Before going on to talk about what a career in engineering is all about, there is one other thing to mention about choosing a career in general. Sometimes two careers can be tied together. For example, engineering and law make a good combination. So do engineering and commerce. So do medicine and law. And so on. Give these combinations a thought while you're trying to decide on your career.

The main thing, though, is this: *choose a career that fits you.*

# II

# WHAT YOU NEED TO KNOW ABOUT ENGINEERING

# II

# WHAT YOU NEED TO KNOW ABOUT ENGINEERING

So far we have told you one good way to choose your career — whatever it may be. And we've given some suggestions on where to find out about various careers. Now we're going to take up the more specific question:

## What Is Engineering?

This is the first question. If we look in the dictionary, we find that the words "engineer" and "ingenuity" both come from the same Latin word, "ingenium," meaning *natural ability or skill.* So the word, itself, indicates that an engineer is a person who has the natural ability to do his job ingeniously.

For example, there's the story about the engineer who found himself up against the problem of stringing cable through a winding pipe. How did he do it? Well, he thought a minute, and then tied a piece of string to the tail of a cat, put the cat in one end of the pipe, and coaxed her through by a blast of air from the rear.

That isn't the usual way to solve engineering problems, of course. But it does show that an engineer sometimes has to be pretty ingenious when he's trying to find the answer to a practical problem.

But a broader and more accurate definition of engineering as a profession is this:

> *Engineering is the art and science which makes the properties of nature, and the sources of power in nature, useful to man.*

That definition, then, means that the engineer not only must be an ingenious person, but also a person specifically trained and experienced in making use of materials, money, and men so that nature can be made to serve mankind.

Now we're talking about the engineer as a professional man. You may have heard some technicians, craftsmen, artisans, and skilled machine operators called "engineers." These people are important to society, and, as a matter of fact, you may even find that the careers these people follow are ones which would suit you better than the

*The Emery-Tatnall Testing Machine, capable of applying a 3,000,000 pound load*

professional engineering we're talking about. But we are not going to talk about such technicians. We're going to stick with the engineer as a professional man.

What's the difference? Usually an engineering project requires the services of three distinct kinds of industrial workers: (1) The professional engineers, (2) The technicians, and (3) The skilled artisans. Let's see how the law of the land tells the difference. Here is a quote from the Taft-Hartley Bill, Title I, section 101, sub-section 2, paragraph 12. It's a pretty good definition of the "professional" engineer, as distinguished from the technicians and artisans.

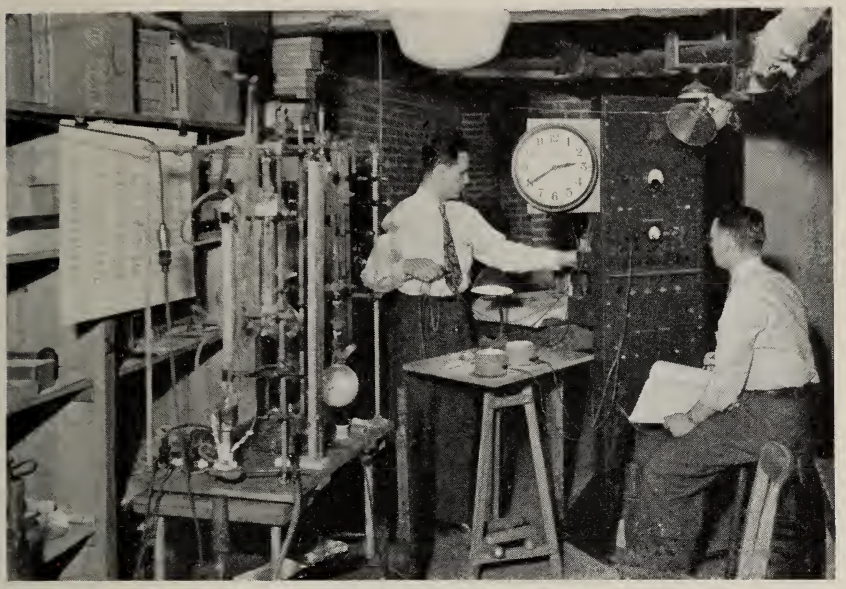
> The term Professional Employee means
> (a) an employee engaged in work
> (i) predominantly intellectual and varied in character as opposed to routine mental, manual, mechanical, or physical work;
> (ii) involving the consistent exercise of discretion and judgment in its performance;
> (iii) of such character that the output produced or the result accomplished cannot be standardized in relation to a given period of time;
> (iv) requiring knowledge of an advanced type in a field of science or learning customarily acquired by a prolonged course of specialized intellectual instruction and study in an institution of higher learning or a hospital, as distinguished from a general academic education or from an apprenticeship or from training in the performance of routine mental, manual, or physical processes; or;
> (b) any employee, who
> (i) has completed the courses of specialized intellectual instruction and study described in clause (iv) of paragraph (a), and
> (ii) is performing related work under the supervision of a professional person to qualify himself to become a professional employee as defined in paragraph (a).

## The "Engineering Method"

So far we've defined engineering in general, and professional engineering in particular. But you still need a more complete picture of what engineering is. You can get this picture by seeing how the engineer works.

For the most part, the engineer not only makes the properties of nature serve man; he does so in a certain way. Here is a pattern of the way he usually goes about solving his problems. He asks and answers these questions in this order:

1. What kind of a problem is it? What is its scope?
2. Into what parts can I analyze the problem?
3. How are these parts related to one another?



*Graduate Students Working on Neutron Physics*

4. How important are the various factors in each part? Have I discarded the unimportant factors, have I thoroughly investigated the factors I don't know about, and have I arranged the factors of each part of the problem according to importance? Have I considered human relations and economic aspects as top-ranking parts of the problem?
5. By working backward, can I put the parts of the problem together in such a way that I arrive at the original problem again?
6. Have I checked and rechecked my solution to the problem to be sure it's the best solution?

From this statement of the engineering method you see that the engineer not only thinks analytically, but also that he works systematically. In fact, it is the combination of this organized, well-planned attack on a problem plus the engineer's honesty and depth of thinking that is one of the outstanding hallmarks of the engineering profession.

Now that you know what professional engineering is, and, in a general way, how the engineer works, there is more you need to know in order to complete your picture of the engineering profession. We can help you find out some of these things — the personal characteristics of an engineer, a list of the types of jobs that engineers perform,

and information on what kind of education an engineer should have. There are several other things you should know, though. For instance, how do you actually put your knowledge to work? The best place to find the answer to this particular question is from an experienced engineer. But the answers to other questions you will have to get from still other sources.

## What Kind of Person Is an Engineer?

It's possible to find out what a "typical" engineer is like, and whether or not you are "typical." There are many vocational guidance organizations which will give you a series of tests which will tell you what your "personality profile" is. And these organizations will then compare your profile to that of an "average" engineer.

The only trouble is that there is really no such thing as an "average" or "typical" engineer. Two engineers may be doing two different jobs — jobs which are as different from one another as surgery is from farming.

As a result of thinking that there is such a thing as the "average" engineer, many popular, but incorrect, ideas have arisen — such as the one that "all engineers are introverts, or people who don't mix

*Propeller Testing*

with other people very well." The fact is that men holding a great number of engineering jobs — especially those jobs in administration and in sales — are just the opposite from introverts. They are extroverts, or people who mix with others especially well.

First, then, here is a list of characteristics that successful men in any kind of work should have. Obviously an engineer can't do a good job without them.

1. Willingness to work hard throughout life
2. Hardihood to persist and endure
3. Honesty in thought when dealing with facts and in action when dealing with men
4. Ability to cooperate with others
5. The capacity to assume leadership

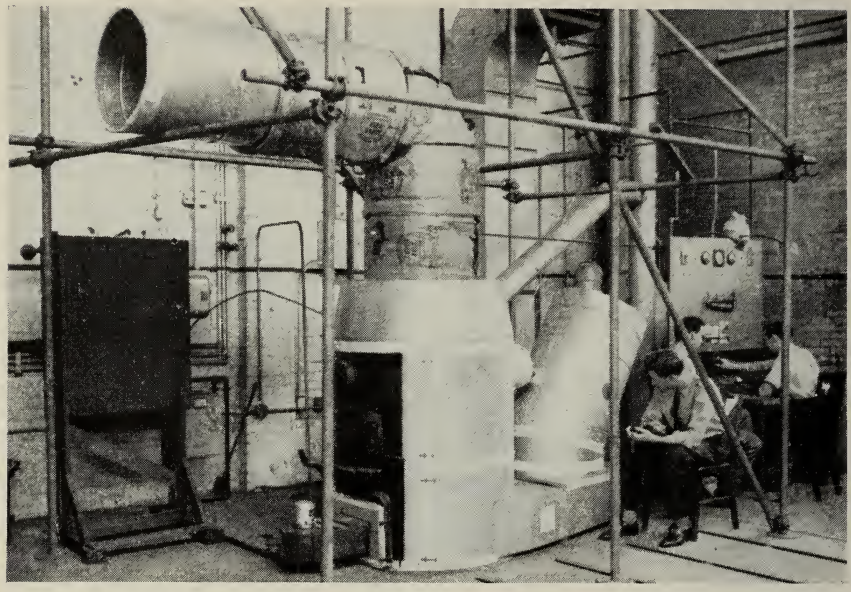
In addition to these characteristics the successful engineer needs others. Because engineering is a mental occupation rather than a manual occupation the following personal characteristics are mostly mental:

1. A genuine interest in mathematical analysis, design, research, and development
2. An unfailing desire to know the underlying basic truths about natural phenomena
3. Ability to weigh ideas or proposals and to make wise decisions
4. Ability to think logically
5. The imagination to set up mental pictures
6. The skill necessary to devise ingenious equipment and create ingenious ideas

We don't mean that every successful engineer has every one of these traits. There is such a variety of engineering jobs that an engineer will need these characteristics in a greater or lesser degree depending on the nature of his particular job. On the other hand, we have not included many of the characteristics necessary for success in specialized engineering jobs. For the most part the particular traits belonging to a particular job will be fairly apparent when you look into that job. But the list does give a good general idea of those qualities you'll have to have for success in most engineering work.

Here's a good way to find out whether or not you have some of these qualities. Try asking yourself the following questions:

1. Do I like puzzles such as mechanical puzzles, crossword puzzles, jigsaw puzzles and mathematical puzzles?
2. Do I want to know why things happen the way they do?



*The Furnace and Test Equipment used for Warm Air Research work*

3. Do I have a curiosity about, and an interest in, natural phenomena?
4. Do I like mathematics, and do the reasons given in a mathematical proof seem convincing?
5. Do I have imagination; that is, can I set up mental pictures of things from just a description of them?
6. Do I accept the first meaning of a sentence or paragraph that occurs to me, or do I read it over to see if it might have another meaning?
7. Am I ingenious in devising ways of making pieces of equipment work or in finding a new way to solve a problem?

You don't need to give an unqualified "yes" to every question; different jobs need different qualities. If you can answer most of these questions with a "yes," though, you can be pretty sure that you have the native ability to become a successful engineer. On the other hand, the mere fact that you do answer most of the questions with a "yes" does not, in itself, mean that you can become successful in *every* type of engineering job. In sales and service work, for example, you would also need to have qualities peculiar to salesmen.

## The Kinds of Jobs in Engineering

In order to be successful in the engineering profession, then, you must: (1) Have personal characteristics similar to those of other members of the profession, and (2) Have or develop additional characteristics which will fit you particularly for the job you enter. Therefore you need to know what kinds of jobs there are in engineering. And not only should you know what each individual job is like, in itself, but also see how the jobs relate to one another. Because of this relationship among engineering jobs we can classify them in three ways.

In the first place, we can classify them according to the main branches of engineering that are recognized in industry. Secondly, we classify them according to the functions of the various jobs. And lastly, we classify them according to the degree of responsibility connected with the job.

### Classification of Jobs According to Engineering Branches

In the early days of history, engineering meant the building of roads, bridges, forts, and other structures for military use. Later it became clear that they had to build similar structures for non-military uses, and so professional engineers made their first big split — the "civil" engineers separated from the military engineers. As the years went by, and as scientific and technical knowledge was amassed beyond the power of any one man to master and apply it all, there were more splits resulting in more main branches. In recent years, each of the main branches has been further subdivided.

A few of these subdivisions are shown in the section on curricula (see pages 46-82). There we call them "options." But the classification and brief description which follow list only the main branches. They are based partly on the list of accredited curricula published in the Fifteenth Annual Report of the Engineers' Council for Professional Development.

1. *Aeronautical Engineering* involves working with problems of aircraft structures, aircraft power plants, and other specialized instruments and equipment. It is sometimes taught as a part of mechanical engineering. Aeronautical engineering also requires some knowledge of civil and electrical engineering as they apply to the aviation industry.

2. *Agricultural Engineering* deals with the solution of problems in the application of mechanical, electrical, and civil engineering to the

farm. Such problems concern the design and development of (1) gasoline and electrically powered farm machinery and implements; (2) farm buildings, including their arrangement and such functional requirements as lighting, heating, and ventilating; and (3) such physical improvements as drainage, soil erosion control, flood control, land clearing, and irrigation.

*A Demonstration of Contour Plowing for Soil Conservation*

3. *Architectural Engineering* combines the knowledge of civil, electrical, and mechanical engineering with knowledge of the principles of architecture. With this knowledge the architectural engineer designs and constructs complete buildings and structures, paying due technical regard to the choice of construction materials and methods as well as to the selection of the necessary electrical and mechanical equipment for the building. Throughout the entire process he keeps foremost in his mind the esthetic quality not only of the over-all structure but also of each part and its contribution to the complete picture.

4. *Ceramic Engineering,* closely allied to mining and metallurgical engineering, concerns the processing and application of such nonmetallic minerals as glass, porcelain enamels, structural clay products, refractory materials, whitewares, pottery, abrasives, and cements. In connection with the operation of ceramic manufacturing processes, the ceramic engineer also utilizes his knowledge of electrical and mechanical engineering.

5. *Chemical Engineering* involves the development and application of manufacturing processes by which raw materials are changed in chemical composition and physical form for industrial and commercial use. The processes which bring about these changes have been separated by the chemical engineer into individual physical and chemical processes which are known as "unit" operations. A series of these unit operations are combined by the chemical engineer in the design and development of a complete manufacturing process. Some of the more familiar results of the chemical engineer's work are the production of fertilizers from nitrogen in the air, plastic materials from wood pulp and coal, synthetic rubber and aniline dyes also from coal, and high-octane gasolines from crude oil.

6. *Civil Engineering* is, as was mentioned previously, the oldest of the several branches. It is also one of the broadest. Traditionally dealing with the construction of roads, bridges, railroads, buildings and other structures, the work of the civil engineer also includes the design and development of air fields, harbors, canals, dams, tunnels, and water and sewerage systems. In the performance of his work the civil engineer has to cope with all sorts of physical conditions, devise ingenious ways of solving engineering problems, develop new construction materials with the help of chemical and metallurgical engineers, and create new machinery with the aid of mechanical and electrical engineers.

7. *Electrical Engineering* work concerns the problems of the generation, transmission, distribution and utilization of electrical energy. Because of the widespread use of electrical energy both industrially and privately, the range of the jobs performed by an electrical engineer is also very broad. The nature of his job ranges from work on massive generators to household appliances, from work on high-powered radio and television transmitters to miniature electronic devices, from work on problems of industrial lighting to the manufacture of small flashlight bulbs. Often his work overlaps into other branches. When it does, his knowledge must be correspondingly extended.

8. *Engineering Physics,* though not generally recognized in industry as a branch of engineering, is beginning to assume importance because of the recent developments in atomic energy. The physicist concerns himself mainly with pure research into physical phenomena and the laws governing them; the engineering physicist tackles the problem of putting these phenomena and laws to work. He actually works in many of the branches listed here. In the development of atomic energy,

however, the engineering physicist worked right along with the physicist and the chemist in the design and development of manufacturing plants and equipment needed for the process of nuclear fission.

9. *Industrial Engineering.* While other branches of engineering are concerned primarily with the function and quality of a product, industrial engineering is concerned essentially with the cost of the product, and the production of goods according to schedule. It is a science of planning for manufacturing, just as the older branches of engineering are essentially sciences of planning designs. It is concerned with coordinating men, materials, machines, and money to the end that a product of the quality specified by the designer can be produced at a minimum cost, when the consumer wants it. It involves planning the organization, analyzing the product design in terms of manufacturing procedures, selecting machinery, designing special tooling, determining the plant layout and ways to handle materials, establishing the work methods and output standards, studying wage payment systems, and setting up methods of quality control. Industrial engineering can apply to any kind of manufacturing, regardless of whether the product is metal, cloth, paper, plastics, etc. Because of the highly mechanized nature of modern industry, the industrial engineer must be essentially a mechanical engineer with background in management, economics, and accounting. Since the human element is a major factor affecting the outcome of his plans, it is also desirable for him to have a background in personnel management, psychology, and sociology.

10. *Mechanical Engineering* deals with the generation and transmission of power and the design, construction, operation, and testing of all kinds of machinery. Like the civil and electrical engineer, the mechanical engineer performs a great variety of jobs. In the transportation field alone he works with marine, railway, automotive, and aircraft equipment. In addition his jobs range from working with such equipment as machine tools, engines, and turbines to refrigerators, air conditioners, and heating and ventilating plants. The knowledge the mechanical engineer needs must extend into related fields as his particular job demands.

11. *Metallurgical Engineering,* closely allied with mining engineering, concerns the reduction or separation of metals from ores, the refining of the metals thus separated, and finally their preparation for industrial use. The metallurgical engineer uses his knowledge of chemistry in developing methods of metal separation and refining; he

uses his mechanical knowledge to develop processes for working and shaping metals and alloys; and he uses his knowledge of physics to investigate the nature, structure, and physical properties of metals and alloys, including the methods of testing and heat treating them.

12. *Mining Engineering* normally precedes metallurgical engineering in the sequence of finding and developing metallic and nonmetallic minerals from their ores. The mining engineer locates ore deposits, including those of metallic minerals and such nonmetallic minerals as coal and petroleum; he develops and operates the mines and wells needed to remove these minerals from the ground; and he gives the ores any preliminary treatment needed prior to refining. His job requires not only a good knowledge of engineering geology so that he can locate the ore deposits, and a knowledge of mechanical engineering so that he can design and develop the necessary equipment; in addition he needs a knowledge of several non-technical subjects so that he can supervise the actual mining operation.

13. *Petroleum Engineering* involves the complete cycle of locating and extracting petroleum and refining and developing petroleum products. Sometimes handled as a division of chemical engineering,

*The Electronics Laboratory for studying Vacuum Tube Circuits is designed for two classes*

sometimes as a division of mining engineering, and less frequently as a division of mechanical engineering, petroleum engineering is more frequently classified as a separate branch. In the location and extraction of petroleum deposits the petroleum engineer uses his knowledge of geology and mining; in the development of equipment for the extraction and processing of petroleum he uses his knowledge of mechanical engineering; for the refining and development of petroleum products he uses his knowledge of chemistry almost exclusively.

## Classification of Jobs According to Functions

By describing each of the main branches of engineering we have given you only part of the picture. True, you now have a very general picture of the kind of work that goes on in each of these branches, but we haven't yet made clear that one man does not perform all the different kinds of work connected with any one branch. In fact, in the engineering job you get you will probably do only one or two of these kinds of work. Of course, also you have to remember that as you change jobs you'll probably end up having to know how to perform several of these kinds of work — or functions.

For example, in the list of jobs we're going to give you, the first two are *Research Engineer* and *Development Engineer.* Now you might be a research engineer in the branch of, say, chemical engineering. Or you might be a research engineer in mechanical engineering. Or you might be a development engineer in either chemical or mechanical engineering. Then, just to make it more complicated, you might be a research engineer *and* a development engineer in one of the two branches.

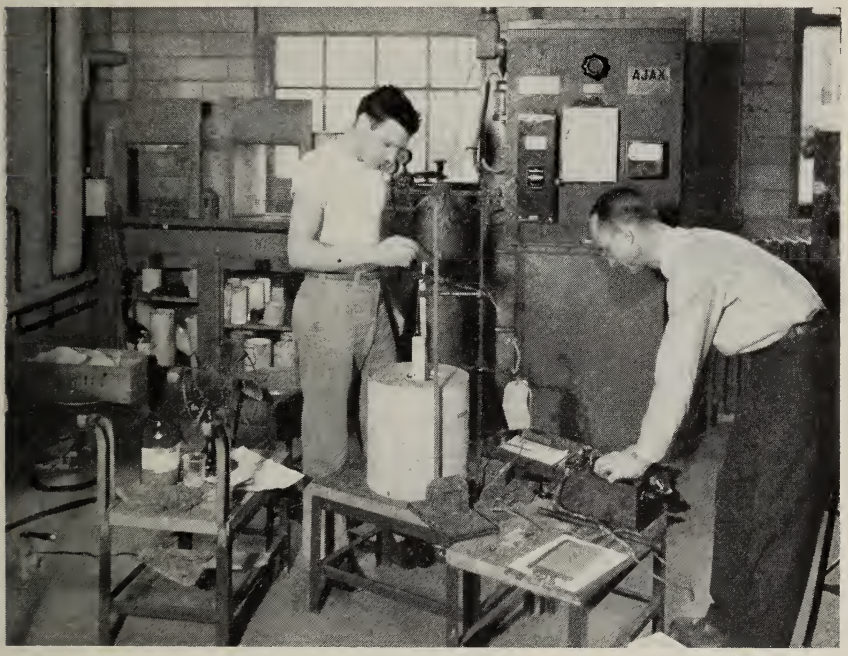
One more thing you should understand is that not all of the main branches of engineering have as a part of their work every one of the job functions in the following list.

1. *Research Engineer.* As a research engineer your energies will be devoted to extending the horizons of knowledge. You must search and study the literature on a particular subject, make calculations to verify theory, and conduct experiments to prove, reject, or modify existing theories. As an engineer in *pure* research you will investigate physical laws in order to increase scientific knowledge, without being particularly concerned about the immediate application of your discoveries. In *applied* research your aims will be to solve specific manufacturing problems, to develop new equipment, and to discover new materials for which there is a need.

2. *Development Engineer.* In development engineering, your work

will consist mainly of taking the results and discoveries of research and developing them into useful methods, products, or apparatus. Also you will need to do a lot of experimental and analytical work in order to get a product into its final form for production.

3. *Design Engineer.* If you decide to work as a design engineer, you will be responsible for making detailed plans and specifications for constructing a system or producing a piece of apparatus. You'll make the necessary calculations and sketches, and you'll either write, or supervise the writing of, the detailed specifications. Then you'll select




*High-Frequency Induction Equipment for Melting Metals and Alloys*

the materials and processes, help prepare the specifications for test procedure, and finally establish acceptable performance standards for the manufacture of equipment. To do this you'll need to be analytically-minded and be able to visualize what happens in the operation of a piece of equipment. You must also keep up with the latest developments and patents in your field.

4. *Production Engineer.* You are responsible for the manufacture of products and apparatus from raw materials and designs if you

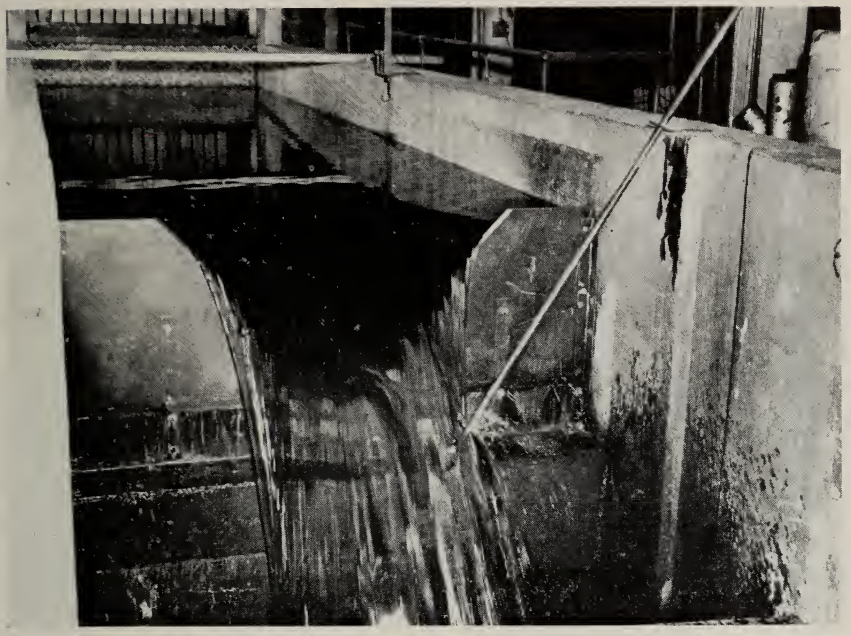
become a production engineer. Therefore you must analyze the methods, processes, and equipment used in the manufacturing operation. Keeping costs in mind, you must work closely with the design engineer on manufacturing problems. In addition to having a good knowledge of engineering and manufacturing procedures, you must also know about the principles of industrial management and the problems of human relations that go with them.

5. *Test Engineer.* As a test engineer you will be in direct charge of the actual testing of apparatus and equipment to find out whether it meets specifications and accepted engineering standards. It will be your job to see to it that the correct and standard test methods are safely applied. You will probably also consult with the design engineer on special testing problems and on the development of cheaper and improved methods of testing.

6. *Application Engineer.* If you work as an application engineer you will be concerned with problems involving complete plants and systems. You will be expected to recommend specific equipment and coordinate the engineering requirements of the entire installation. Normally you will have to confer with the design engineer to inform him of the characteristics which each piece of apparatus in the system should have. In a manufacturing company you will also be expected to act as a consultant to the sales department in order to help select the specialized equipment which will best serve the customer's needs.

7. *Sales Engineer.* In sales engineering you will work directly with the customer as the manufacturer's sales and engineering representative. As in any sales work, you will need to study your customer's needs. You will also need to know thoroughly the equipment you are selling so that you can explain its design, construction, and operating features to the customer. Usually you will be responsible for arranging the delivery date of the equipment and occasionally for negotiating its sales price. In addition to your technical training, you will need the type of personality that inspires confidence. Also you'll have to be able to work with people.

8. *Service Engineer.* If you decide to work as a service engineer you'll supervise the installation of new apparatus and perform the final tests. You'll investigate customer complaints and correct any trouble the equipment may be giving the customer. Many times you'll have to work fast, because the equipment which needs service may be so important that it has to be repaired immediately — even under emergency conditions. Since your work will cover a broad field under widely varying situations, you will need a good, broad engineering

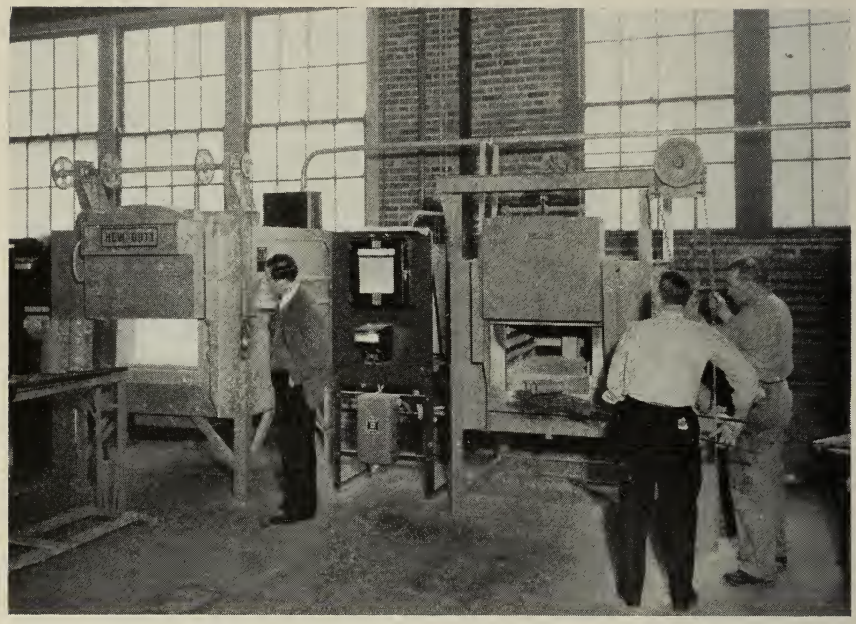


*V-Notch Weir to measure discharge from pump with capacity of 13,500 gallons per minute*

knowledge along with plenty of ingenuity at times. Since service engineering requires that you deal directly with the customer, many companies combine service and sales engineering into a single job.

9. *Construction Engineer.* Even though you do not directly enter the field of civil engineering, as a construction engineer you may be called upon to perform similar services in your own field by supervising the construction of facilities and structures from the designs and plans. In this work you'll have to be familiar not only with the technical problems as they apply to your particular field but also the problems associated with construction work — namely, how to obtain materials, how to select and use equipment properly, and how to handle men. The ability to work with others and direct their efforts is as important to the construction engineer as is his technical background.

10. *Operating Engineer.* If you decide to work as an operating engineer you'll have the responsibility of operating part or all of an engineering enterprise safely, efficiently, and without interruption. You may work with a group of machines, a plant, or a system. You will supervise the getting of supplies and repair parts, the protecting and



*Electric Furnaces — Firing Porcelain Enamels*

keeping up of the equipment, and the handling of operating personnel. In case of a breakdown or an emergency, you must have enough ingenuity and resourcefulness to put the machines in service again, frequently under the most adverse conditions. Like the construction engineer, you must have a broad engineering background and be able to handle men.

There you are — the engineering jobs classified according to function. This list was not made up in the order of importance of these functions. It was made up in a chronological order — from the time of the first handling of a new discovery to its final use by mankind.

## Classification of Jobs According to Responsibility

The third, and final, way of classifying engineering jobs is according to the kind and amount of responsibility needed for the job. In some of the various jobs listed above (according to function) you won't find all of the levels of responsibility existing.

1. *Technical work* — Probably the first level of responsibility you'll experience when you go to work as an engineer will be the level

in technical work. This means you solve technical problems under the general supervision of someone else. Your supervisor will tell you what problem he wants you to attack, and will let you know when you've come up with a satisfactory solution.

2. *Supervisory work* — The next level you'll rise to (only after you've proved your ability, though) is that of supervisory work. Here you'll assign problems to other engineers, and direct their work. As a supervisor, you'll be responsible for the proper operation of a group, or of a department, in some organization.

3. *Executive work* — The final, and highest, level of responsibility you'll reach (but only if you are an engineer of superior ability and experience) is that of executive work. Here you'll be concerned with the broader aspects of the operation of your company — that is, with such things as general policy, organization and coordination, personnel, finance, law, and public relations. Many engineers hold important administrative positions, especially in engineering industries.

## What Kind of an Education Does an Engineer Need?

Engineering is essentially a mental occupation. Therefore, you should get an education that aims mostly at developing your mental ability. But such an education is not the kind that you get overnight. It will take hard work and a long time. As a matter of fact, once you begin educating yourself, you'll really never stop.

In general, engineers usually get their education in three separate steps: (1) In high school, (2) In college or university, and (3) In industrial organizations after they get out of college.

When you're in high school, or at the "pre-engineering" level, you should begin to think about whether you want to get into engineering. That's why we recommend in the first part of this booklet that you go through certain steps to decide upon your career while you are still in high school. If, while you are in high school, you aim at getting a solid background in the following courses or studies, you'll have a good foundation for doing well on the higher levels — in college, and in business.

1. You should have a complete mastery of the principles of arithmetic, algebra, plane and solid geometry, and trigonometry. We mean "complete mastery," too. It won't be enough just to be *exposed* to such courses.

2. You should have a thorough understanding of physics and chemistry.

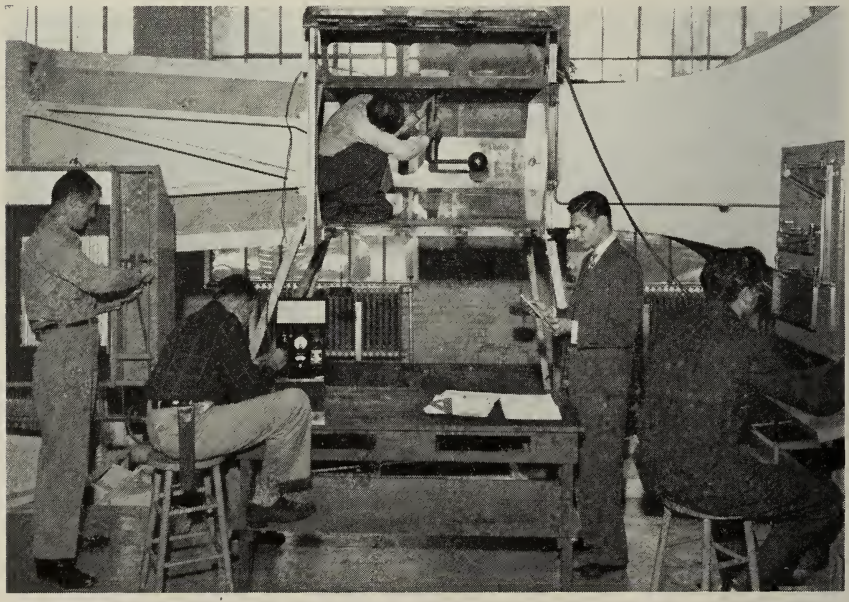
3. You should have a good background in English, economics, and

government, so that you'll be able to understand the society you live in, and so that you'll have a good foundation for being able to come up with a true "engineering solution."

4. You should have everything down pat that you've taken so far, and you should have some very good grades to show for your high school work.

It might help you to know that, right now, too many high school students are coming to college with not enough background in mathematics, physics, and chemistry. It seems that large numbers of students who want to get into engineering come to college with far too many of their high school courses in shop work, and with far too few in the physical and social sciences. When a student with such a weak background tries to keep up the pace of college work, he usually finds that he can't make it, and he goes on probation or flunks out. The same thing happens to the student who made poor grades in high school.

The second step in your education is college. That's your next step on the road to being an engineer. It isn't the final step, but it is an important and essential step, because it will give you the foundation on which you can build your engineering career through practical experience and continued study.



*Small Wind Tunnel in Aero Lab I*

In fact, the foundation for your career that you get from college training is so important to you that it will pay you to understand and appreciate fully just how your college work can lead you to your goal. Here are the objectives of your college work: to gain knowledge; to develop the mental skills needed to make use of this knowledge; and to develop the attitudes and personality which make for successful engineers and good citizens. Here are each of these objectives in more detail:

## Objectives of the Engineer's College Training

I. To Gain Knowledge
   A. Of fundamental laws and principles.
   B. Of factual engineering information.
   C. Of cultural, sociological, and economic background.

II. To Develop Mental Skills
   A. Facility in expressing yourself by means of words and graphic devices.
   B. Facility in visualizing and comprehending.
   C. Imagination, ingenuity, and resourcefulness.
   D. Ability not only to find sources of information, but also to sort out what counts from what doesn't count.
   E. Ability to think straight, to reason logically from fundamental principles, and to reach correct conclusions.
   F. Ability to analyze, discriminate, and synthesize — that is, to use the "engineering method."

III. To Develop Proper Attitudes and Personality
   A. Honesty with facts and men.
   B. Realization of citizenship responsibilities.
   C. Spirit of cooperation with others in a common endeavor.
   D. Leadership.
   E. Industry, initiative, and self-reliance.
   F. Confidence in your ability to learn, and to carry on individual studies, investigations, or research.

What are the different ways you can reach these objectives? Obviously the first group, and part of the second, are gained largely from your school work. Parts C through F of the second group, and the development of many of the attitudes you need, can also be gained at school if you get the mental freedom which ideal teaching gives you.

And the final objective of your college work — the development of a personality which is necessary for both a successful engineering

career and a successful social life — also takes a lot of doing. You'll find that a good personality can be developed better by mixing with your fellow students than by formal education. Go to parties, church activities, banquets, and dances. Take part in group meetings and student activities. In a later section, you'll see what the University of Illinois has to offer along this line.

Here's why we're making a point of social improvement. It so happens that engineers have often been accused — and rightly so — of a lack of social consciousness. Colleges are taking care of this lack. In fact, they're taking care of it faster than most engineers think. But the engineering student often becomes so engrossed in his college work that he tends to put off getting into social life until after he graduates — when he thinks he'll have more time, but when, really, it's almost too late. He just keeps putting it off.

Of course, we're not advising you to become a social butterfly. But there's not much chance that you will be, if you are like most engineering students. Most engineering students tend to lean the other way, and that's why we know it is safe to tell you to go all out in meeting and mixing with people in social situations.

The third step in your education for engineering is the education you get from work with industry after you graduate. It's the final step, but it never really ends. Why? Because real education comes from the inside; you educate yourself. Education is not a process of pouring knowledge into your head from the outside; it is rather a process of "'the leading out of' — out of a state of mental confusion due to lack of knowledge."

In the primary schools and in many secondary schools this "leading out of" is done for you by your teachers. In college, and to a still greater extent, in your first industrial job, *you* do the job. You lead yourself out of mental confusion, with only as much help from your instructors and supervisors as you need to develop the ability to do the job yourself.

After you get out of college, you'll find that many organizations have set up formal, post-college training courses. These training courses are planned in several different ways. In one, for instance, the course runs continuously for a year. In another the training is sandwiched in with your regular work; such a sandwiched course usually takes longer. And there are other plans — most of them some variation of these two examples. In addition to these, most large companies offer you refresher courses, and encourage you to take them every once in a while.

But, in general, throughout the rest of your career, your further education lies in your own hands. And this fact is education in itself. Because it is *your* job, you automatically develop your own initiative, and your sense of responsibility.

Now you have most of the information you need about the engineering profession and the engineer. All this has been basic information. In the rest of this booklet we'll describe how you can gain knowledge and develop your mental skills and personality at the University of Illinois.

# III

# GAINING KNOWLEDGE AT ILLINOIS

# III

## GAINING KNOWLEDGE AT ILLINOIS

Two of the goals we've told you that you ought to reach are *the gaining of knowledge* and *the development of mental skills.* We've found that you gain knowledge best by going to classes and by studying textbooks, and that you develop mental skills best if your professor teaches you in a way that allows you mental freedom and stimulates your thinking. There are several different ideas that educators have about what you, as an engineer, should learn from classes and books, and about how you should best be taught. But since the founding of the University of Illinois in 1868, we have found that the basic decisions about what and how you should learn still hold today. That doesn't mean that the courses taught and the methods used haven't changed. Courses and methods are details of the broad basic decision made in the beginning. One part of that decision was that courses and methods should be changed to keep up with the times, and to give you the background you will need.

Let's look at a little history to show how the University has always held to its basic decision, and yet has quickly been able to change to keep up with the times and to give its students what they needed later on.

At first the University of Illinois was called "The Illinois Industrial Institute," and the College of Engineering was called the "Polytechnic Division." This Polytechnic Division of the Illinois Industrial Institute offered four courses of study — (1) Mechanical science and art, (2) Civil engineering, (3) Mining engineering and metallurgy, and (4) Architecture and fine arts. For the first two years you could have chosen any course you wanted. But in 1870, with the establishment of the College of Engineering, your teachers would have "recommended" definite programs of study to you. A little later these "recommended" programs became "required," and you would have had to take them. Then about 1915 they came around to the system of requiring a 4-year course of study leading to a degree, and gave it the name, "Curriculum."

The Engineering Library

## The Pioneers

Foremost among the men responsible for making that broad basic decision in the early years — the decision which has stood the test of time until today — was Stillman W. Robinson, the first teacher in the new college. He was appointed professor of mechanical engineering in 1869, and almost at once he proposed a plan setting up the first purely educational shop in the United States. Under this plan, engineering students did shop practice while they were in school, and, in addition, were required to keep "vacation journals and memoirs." These were notebooks in which they sketched and wrote about unusual mechanisms they saw when they visited industrial plants during the summer vacation. When they got back to school in the fall, they would discuss in class what was in their notebooks. The whole idea was designed to relate the mathematical and scientific knowledge they got in school with what actually was going on in industrial practice.

Professor Robinson was associated with and followed by a group of pioneers in this almost new type of education. Among them were Professors Selim H. Peabody, in mechanical engineering, later elected regent (president) of the University; J. Burkitt Webb and Ira O. Baker, in civil engineering; N. Clifford Ricker, in architecture; Arthur T. Woods and Lester P. Breckenridge, in mechanical engineering; Arthur N. Talbot, in municipal and sanitary engineering; Theodore B. Comstock, in mining engineering; and Samuel W. Stratton and Albert P. Carman, in physics. Their influence persists to this day in many engineering institutions and in professional practice.

During the 1870's and 1880's minor changes and revisions were made in the courses of study. In 1889 the first major development came with the actual establishment of the physics department in the College of Engineering. Then in 1890 the department of theoretical and applied mechanics was founded and a course in electrical engineering was offered in the mechanical engineering department. However, the electrical engineering course was transferred to the physics department in the following year. Also in 1891 two new courses — architectural engineering, and municipal and sanitary engineering — were offered. Two years later the mining engineering department was discontinued.

In 1898 a separate department of electrical engineering and a course in railway mechanical engineering were set up. Since the civil engineering department was already providing instruction in how to build and keep up railways, the railway mechanical engineering course

*The Time and Motion Study Laboratory*

*A class in Machine Design*

stressed the design and operation of locomotives and rolling stock. Also in 1898 the semester system was adopted; it replaced the term system with its three unequal periods of 14, 12, and 18 weeks.

In 1905 a course in ceramics and ceramic engineering was offered by the College of Science; ten years later it was transferred to the College of Engineering. In 1907 the railway engineering department was organized to take care of the three courses in civil, mechanical, and electrical railway engineering. The mining engineering department was established again in 1909, and in the same year the holding of weekly lectures by prominent teachers and practicing engineers was introduced. All freshman engineers had to attend in order to learn about professional practice and ethics. This plan was followed with little change until war forced its discontinuance in 1941.

## The College Makes Some Major Changes

During the five years from 1910-1915, in keeping with the trend started by the freshman lecture program and because the College developed so rapidly after 1890, Dean Goss recommended taking stock of the courses and policies we had. In 1911 a faculty committee was formed to conduct this survey and make recommendations for any changes which seemed necessary.

Five major actions were taken:

1. The total semester hours required for graduation was unchanged.
2. The thesis which had been required for graduation was made optional, because there were not enough facilities for the necessary individual instruction to the very much larger student body.
3. The proportion of time spent on each of the following main groups of studies was recommended to be:
   a) Language and general cultural subjects — 25%
   b) Mathematics, pure and applied, including all technical subjects strongly mathematical in nature — 45%
   c) Technical laboratory, drafting, surveying, etc., and all other subjects that do not require extensive preparation outside of class — 30%
   d) Technical courses, largely informational in character, and less closely related than others to the specialized purpose of the curriculum — the time devoted to these courses was small enough to be neglected.

*Students making Hardness Tests of Steel and other materials*

4. Several specific subjects were changed and rearranged, and the hours of laboratory work were cut down to permit the inclusion of 9 hours of non-technical electives. This change was designed to give the engineering student an opportunity to broaden his education and outlook by taking subjects in other departments in the University.
5. Engineering students were required to have credit in the basic writing courses before they could attain junior standing. In addition, students who used poor written and oral English had to improve themselves by taking additional courses without credit. This plan was so well received that it was adopted throughout the University and has stayed pretty much as is up to now.

Two other developments were made during the same period. First, in 1913, the shop courses were completely revised. Professor Robinson's strictly working-with-hands set-up was changed by adding a

working-with-mind set-up. This meant that the student would systematically investigate how efficiently processes, methods, and equipment worked, in addition to making them work. This was a big change — the first of its kind made in engineering schools in this country. From it have come the laboratory courses we now have.

The second important development was the senior inspection trip. Each year, since about 1900, seniors had been spending three or four days at their own expense, under the guidance of some faculty members, visiting industries in Illinois and neighboring states. This was a valuable activity, and the students liked it. So in 1915, the College of Engineering made this senior inspection trip a requirement for graduation. Now the trip is still listed as a part of the various curricula, although it is not now a requirement for graduation. Most of the departments still sponsor the trips as they are able.

Although this era of momentous changes in policy and program was by no means the only one in the history of the College, it has been described in detail to give you an idea of what kind of thinking has gone on to make an educational program that best fits your needs. In addition, the size of these changes is typical of the kind of thing we have to do in these days of industrial progress and technological

*The UHF Laboratory — with specially designed facilities for testing television circuits and other Ultra-High Frequency applications*

*A class in Battery and Ignition Systems*

advancements if you are to get the most out of your engineering education.

In the rest of this discussion we're only going to hit the highlights of the College's development. There have been a lot of studies and changes in policy since 1920, but we're going to stick to changes in departments and curricula. As a result, we won't be able to mention many of the "options" which have been added to the various curricula from time to time. But since an option is a special field of study within a particular curriculum, the fact that we don't discuss them won't make very much difference.

## The Recent Developments

The curriculum in engineering physics was offered by the physics department in 1917. In 1922 a change in the language requirements for admission to the College and a reduction of the non-technical electives from 9 to 6 hours were made. A curriculum in gas engineering was also offered in 1922, but was discontinued ten years later because students didn't seem interested in it. The following year brought the introduction of the general engineering curriculum, administered directly by the College. In 1925 the municipal and sanitary engineering

department was discontinued, but most of the courses in the curriculum were transferred to the civil engineering department as an option in sanitary engineering.

During the early '30's three major departmental changes were made. In 1931 the architecture department was transferred from the College of Engineering to the newly established College of Fine and Applied Arts. In 1933 the department of agricultural engineering was set up. And in 1934 the curriculum in metallurgy was changed to the curriculum of metallurgical engineering. The department of mining engineering and metallurgy then became known as the department of mining and metallurgical engineering.

In the final period of the College's history the department of railway engineering was discontinued in 1940. Its three curricula were again taken over by the departments of civil, electrical, and mechanical engineering. In the next year, all freshman engineers were required to take the same program, so that they would get the chance to become familiar with the various branches in engineering before having to choose one of them. At the recommendation of the State Department of Public Health, the civil engineering department in 1942 offered a five-year curriculum in public health engineering. For the first four years it parallels the regular sanitary engineering option; in the fifth year it includes work in the College of Medicine. And lastly, in 1944 the aeronautical engineering department, separate from previous aeronautical training under civil engineering, was set up.

## Meeting Your Needs

Now you know almost all the essential developments that have taken place in the College of Engineering since it began. Probably you can see that it isn't an easy or a routine job to plan an educational program designed to fit your needs the best. You probably also noticed that a lot of the changes came about only after someone stopped and took stock of the situation.

For instance, look at how often the College had to change the number of hours of elective subjects it allowed. The reason for so many changes is that there were always two considerations which were at loggerheads. On the one hand, we had to realize that the more scientific and technological progress there was in the world, the more technical courses we had to require; on the other hand, we also had to realize that the more complicated society became, the broader your training had to be, and, therefore, the more freedom you should have to study non-engineering subjects by means of taking electives.

Since the end of the war there have been changes, too — most of them only minor ones. We're about to give you a list of the curricula now offered by the seven departments in the College of Engineering, plus those offered by two departments not in the College. Also you'll see the one curriculum which is administered directly by the College, and a description of the three departments which offer service courses to engineering students.

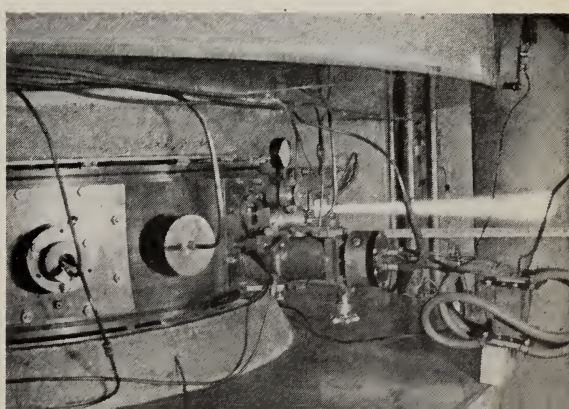
But first, here is the "Common Freshman Program" — the program you will take in your freshman year, no matter what department or branch of engineering you get into. As we said before, the idea of this Common Freshman Program is simply to give you a chance to find out what engineering is all about before you make your final choice of one of the main branches of study.

## The Common Freshman Program

Freshmen in the College of Engineering take this program unless otherwise specified in the curricula outlined on the following pages.

FIRST YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 102 or 103—General Chemistry | 3 or 4 | Chem. 104—Chemistry of the Metallic Elements | 4 |
| G.E.D. 101—Elements of Drawing, or G.E.D. 104—Advanced Drawing | 4 | G.E.D. 102—Descriptive Geometry | 4 |
| Math. 112—College Algebra | 3 | Math. 122—Analytic Geometry | 4 |
| Math. 114 or 115—Plane or Advanced Trigonometry | 2 | Rhet. 102—Rhetoric and Composition | 3 |
| Rhet. 101—Rhetoric and Composition | 3 | Hygiene | 2 |
| Physical Education | 1 | Physical Education | 1 |
| Military Science (men) | 1 | Military Science (men) | 1 |
| *Total* | 17 or 18 | *Total* | 19 |



*Side View of 10,000,000-Volt Deuteron Beam from the Cyclotron*

## Aeronautical Engineering

The curriculum in aeronautical engineering is offered primarily to train you in the fundamental principles of airframe and aircraft power plant design and construction. The courses in the required portion of the curriculum are set up to prepare you for any of the several technical divisions of the aircraft industry, and to give you sound training in engineering fundamentals which can be applied if you practice in related engineering fields. Provision for elective courses lets you pick courses in the fields of airplane design, aircraft power plant design, aircraft production and maintenance engineering, and air line engineering. We don't encourage a high degree of specialization in the undergraduate program, but you can take graduate study and research in aerodynamics, aircraft structures, and specialized phases of the divisions previously listed.

The present rapid development of the areonautical industry provides a lot of good chances for graduates. To help you to take advantage of these chances, every effort is made to offer you courses providing the fundamental instruction necessary for an understanding of the engineering principles upon which these advances rest. Instruction in the fields of supersonic aerodynamics and reaction type engines is also offered, and new courses will be added in all divisions of aeronautical engineering as they are needed.

### CURRICULUM IN AERONAUTICAL ENGINEERING

*For the Degree of Bachelor of Science in Aeronautical Engineering*

#### FIRST YEAR

Common Program for Freshmen

#### SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| G.E.D. 103—Aircraft Drafting and Lofting | 3 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| M.E. 182—Manufacturing Processes | 3 | T.A.M. 156—Analytical Mechanics (Statics and Dynamics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physical Education | 1 |
| Physical Education | 1 | Military Science (men) | 1 |
| Military Science (men) | 1 | Non-technical Electives[1] | 3 |
| *Total* | 18 | *Total* | 18 |

[1] Speech 101 or Eng. 216 recommended.

## THIRD YEAR

| | |
|---|---|
| Aero. E. 201—Aircraft Materials and Processes | 3 |
| Aero. E. 211—Aerodynamics | 3 |
| Math. 345—Differential Equations and Orthogonal Functions[2] | 3 |
| M.E. 205—Thermodynamics | 3 |
| T.A.M. 221—Resistance of Materials | 3 |
| T.A.M. 223—Resistance of Materials Lab | 1 |
| Non-technical Electives[3] | 3 |
| *Total* | 19 |

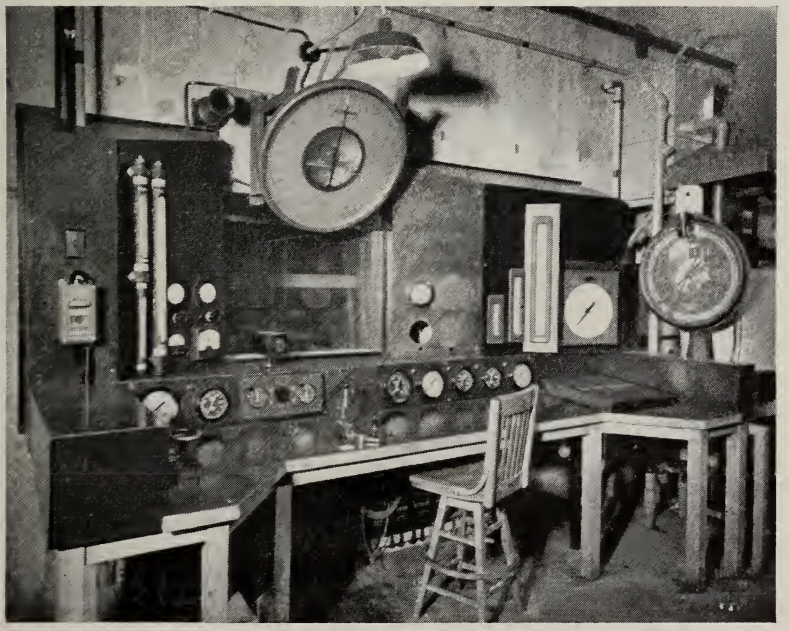
| | |
|---|---|
| Aero. E. 212—Introduction to Aerodynamics of Real Fluids | 3 |
| Aero. E. 220—Aircraft Structures | 3 |
| E.E. 202—Direct and Alternating Current Circuits and Machines | 2 |
| E.E. 203—Direct and Alternating Circuits and Machines Lab | 1 |
| M.E. 222—Mechanics of Machinery | 3 |
| Approved Electives | 6 |
| *Total* | 18 |

## FOURTH YEAR

| | |
|---|---|
| Aero. E. 221—Aircraft Structures | 3 |
| Aero. E. 231—Aircraft Power Plants | 3 |
| Aero. E. 241—Airplane Design | 3 |
| Aero. E. 261—Aerodynamics Lab. | 2 |
| Aero. E. 299—Inspection Trip | 0 |
| E.E. 214—Electrical Equipment for Aircraft and Airports | 3 |
| Approved Electives | 3 |
| *Total* | 17 |

| | |
|---|---|
| Aero. E. 242—Airplane Design | 3 |
| Aero. E. 264—Aircraft Structures Lab. | 2 |
| Aero. E. 262—Aircraft Engine Lab. | 2 |
| Eng. 292—Engineering Law | 3 |
| Aero. E. 290—Seminar | 1 |
| Approved Electives | 6 |
| *Total* | 17 |

[2] Math. 341 may be substituted.
[3] Econ. 108 recommended.



*Engine Test Control Room*

## Agricultural Engineering

The curriculum in agricultural engineering is provided for those of you who plan to enter teaching, research, or commercial and industrial work in this field. You can see how big it is by checking these four main headings: (1) power and machinery, including consideration of the types available and applicable to farm operation; the design of implements, machines, vehicles, and other equipment; and the development and use of various suitable materials of construction. (2) Farm electrification, including electrical service to rural areas, and the development and use of the farm machinery and equipment involved in the extensive use of electricity in agriculture. (3) Farm buildings and housing, including design, location, and arrangement; functional requirements, lighting, heating, and ventilating of farm buildings; and provision for refrigeration equipment, water supplies, and sewage disposal. (4) Soil and water conservation, including drainage, soil erosion control, flood control, land clearing, irrigation, and physical improvements.

The agricultural engineering curriculum which follows is fundamentally an engineering program with a little specialization beginning in the second year. You can have an option in power and machinery and an option in structures and soil conservation. Under this plan you can get a thorough training in basic sciences and engineering design, and at the same time have a chance to specialize in the main fields of agricultural engineering.

The agricultural engineering department, administered by the College of Agriculture and allied with the College of Engineering, is a unit in the Agricultural Experiment Station and the Agricultural Extension Service. So you have the advantage of close contact with the staffs and facilities of both Colleges. The curriculum is administered by the College of Engineering, and degrees are awarded upon authorization by the engineering faculty.

### CURRICULUM IN AGRICULTURAL ENGINEERING

*For the Degree of Bachelor of Science in Agricultural Engineering*

FIRST YEAR

Common Program for Freshmen

## SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Agr. Eng. 111—Farm Structures and Soil and Water Conservation | 3 | Agr. Eng. 112—Tractors and Field Machinery | 3 |
| Bot. 105—Botany for Students in Agriculture | 3 | Agron. 121—Crop Production | 4 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 18 | *Total* | 19 |

## THIRD YEAR

### Machinery and Power Option

| | | | |
|---|---|---|---|
| Econ. 108—Elements of Economics | 3 | Agr. Econ. 120—Farm Management | 3 |
| Geol. 105—Agricultural Geology | 3 | Agron. 201—Soils | 5 |
| M.E. 221—Mechanics of Machinery | 5 | M.E. 183—Materials Casting | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | M.E. 202—Thermodynamics | 3 |
| T.A.M. 221—Resistance of Materials | 3 | M.E. 224—Design of Machine Elements | 3 |
| T.A.M. 223—Resistance of Materials Lab | 1 | | |
| *Total* | 18 | *Total* | 17 |

### Structures and Conservation Option

| | | | |
|---|---|---|---|
| C.E. 115—General Surveying | 3 | Agr. Econ. 120—Farm Management | 3 |
| C.E. 235—Plain Concrete | 2 | Agr. Eng. 262—Farmstead and Home Equipment | 3 |
| Econ. 108—Elements of Economics | 3 | Agron. 201—Soils | 5 |
| Geol. 105—Agricultural Geology | 3 | C.E. 261—Structural Analysis | 4 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | T.A.M. 232—Fluid Mechanics | 3 |
| T.A.M. 221—Resistance of Materials | 3 | T.A.M. 234—Laboratory in Fluid Mechanics | 1 |
| T.A.M. 223—Resistance of Materials Lab | 1 | | |
| *Total* | 18 | *Total* | 19 |

## FOURTH YEAR

### Machinery and Power Option

| | | | |
|---|---|---|---|
| Agr. Eng. 341—Farm Power | 3 | Agr. Eng. 332—Design of Agricultural Machinery | 3 |
| Agr. Eng. 299—Inspection Trip | 0 | Agr. Eng. 393—Special Problems | 3 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 307—Direct and Alternating Current Lab. | 1 | E.E. 309—Direct and Alternating Current Lab. | 1 |
| M.E. 271—Design of Machine Elements | 3 | M.E. 234—Heat Treatment of Metals | 3 |
| M.E. 184—Metal Processing | 3 | Approved Electives | 5 |
| Approved Electives | 4 | | |
| *Total* | 17 | *Total* | 18 |

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Structures and Conservation Option

| | |
|---|---|
| Agr. Eng. 351—Hydraulics of Soil and Water Conservation | 3 |
| Agr. Eng. 371—Advanced Farm Structures | 3 |
| Agr. Eng. 299—Inspection Trip | 0 |
| Arch. 143—Materials and Methods of Construction, or C.E. 351—Drainage and Flood Control, or Approved Elective | 3 |
| C.E. 262—Structural Analysis | 3 |
| C.E. 263—Elementary Structural Design | 2 |
| E.E. 202—Direct and Alternating Current Circuits and Machines | 2 |
| E.E. 203—Direct and Alternating Circuits and Machines Lab. | 1 |
| *Total* | 17 |

| | |
|---|---|
| Agr. Eng. 393—Special Problems | 3 |
| C.E. 264—Structural Design | 5 |
| C.E. 290—Contracts and Specifications | 2 |
| Approved Electives | 6 |
| *Total* | 16 |

## Architectural Engineering

The curriculum in architectural engineering is administered by the department of architecture in the College of Fine and Applied Arts. This curriculum offers you a major study in building design and a thorough training in all forms of building construction. It emphasizes the structural and mechanical aspects of architecture. Since the program includes two years of architectural design, freehand drawing, and the history of architecture, you who are mostly interested in construction also get a lot of knowledge of both the artistic and the practical phases of planning.

This program offers a wide range of elective courses in the social sciences, business, engineering, language, and literature. It also gives you enough training to go into private practice as an architectural engineer. Graduates are eligible to take the Illinois State Board Examinations for the registration of architects after one year's experience under a Registered Architect.

### CURRICULUM IN ARCHITECTURE

Construction Option

*For the Degree of Bachelor of Science in Architectural Engineering*

The curricula in architecture and architectural engineering are in the process of revision. Effective September, 1949, the program will be revised on a five-year basis.

## FIRST YEAR

| FIRST SEMESTER | HOURS |
|---|---|
| Arch. 131—Architectural Design | 3 |
| Art 181—Freehand Drawing | 2 |
| G.E.D. 107—Architectural Projections | 2 |
| Rhet. 101—Rhetoric and Composition | 3 |
| Math. 112—College Algebra | 3 |
| Math. 114—Plane Trigonometry | 2 |
| Physical Education | 1 |
| Military Science (men) | 1 |
| *Total* | 16 or 17 |

| SECOND SEMESTER | HOURS |
|---|---|
| Arch. 132—Architectural Design | 3 |
| Art 182—Freehand Drawing | 2 |
| G.E.D. 108—Architectural Projections | 2 |
| Rhet. 102—Rhetoric and Composition | 3 |
| Math. 122—Analytic Geometry | 4 |
| Hygiene 102 or 105—Personal and Environmental Hygiene | 2 |
| Physical Education | 1 |
| Military Science (men) | 1 |
| *Total* | 17 or 18 |

## SECOND YEAR

| | |
|---|---|
| Arch. 113—Architecture and Civilization of the Early Mediterranean Areas | 2 |
| Arch. 133—Architectural Design | 3 |
| Art 183—Freehand Drawing | 2 |
| Math. 132—Calculus | 5 |
| Physics 101—General Physics (Mechanics, Heat, and Sound) | 5 |
| Physical Education | 1 |
| Military Science (men) | 1 |
| *Total* | 18 or 19 |

| | |
|---|---|
| Arch. 114—Architecture and Civilization of Europe and Islam, A.D. 300 to 1200 | 2 |
| Arch. 134—Architectural Design | 3 |
| Art 184—Freehand Drawing | 2 |
| Math. 142—Calculus | 3 |
| Physics 102—General Physics (Light, Electricity, and Magnetism) | 5 |
| T.A.M. 150—Analytical Mechanics | 2 |
| Physical Education | 1 |
| Military Science (men) | 1 |
| *Total* | 18 or 19 |

## THIRD YEAR

| | |
|---|---|
| Arch. 215—Architecture and Civilization of Medieval Europe, A.D. 1200 to 1500 | 2 |
| Arch. 143—Materials and Methods of Construction | 3 |
| Arch. 245—Structural Elements | 3 |
| T.A.M. 221—Resistance of Materials | 3 |
| T.A.M. 223—Resistance of Materials Lab | 1 |
| E.E. 114—Wiring and Illumination | 3 |
| Foreign Language or Elective | 4 |
| *Total* | 19 |

| | |
|---|---|
| Arch. 216—Architecture and Civilization of Renaissance Europe, A.D. 1400 to 1800 | 2 |
| Arch. 144—Materials and Methods of Construction | 3 |
| Arch. 246—Theory of Structural Design | 3 |
| T.A.M. 211—Analytical Mechanics | 3 |
| Foreign Language or Elective | 4 |
| Electives | 3 |
| *Total* | 18 |

## FOURTH YEAR

| | |
|---|---|
| Arch. 347—Theory of Structures | 5 |
| Arch. 257—Reinforced Concrete Theory | 3 |
| Arch. 283—Architectural Practice | 2 |
| M.E. 252—Heating and Ventilating for Architectural Engineers | 4 |
| M.E. 251—Mechanical Equipment of Buildings Lab | 1 |
| Arch. 299—Inspection Trip | 0 |
| Electives | 2 |
| *Total* | 17 |

| | |
|---|---|
| Arch. 348—Advanced Structures | 5 |
| Arch. 358—Reinforced Concrete Design | 3 |
| Arch. 256—Building Sanitation | 2 |
| Arch. 268—Specifications | 3 |
| Electives | 2 |
| *Total* | 15 |

## Ceramic Engineering

The curriculum in ceramic engineering is designed to prepare you to enter any of the ceramic industries — glass manufacture, porcelain enamels, structural clay products, refractories, whitewares, pottery, abrasives, and cements. General introduction to ceramics is offered in the sophomore year, the fundamentals of ceramic engineering in the junior year, and specialization and practical applications in the senior year.

By choosing your courses properly, you may specialize for either production or research in the different branches of the ceramic industry. The required courses include preparation for the designing of plants and equipment, the construction of kilns and dryers, and the supervision of manufacturing operations.

The department also offers a curriculum in ceramics for those who are not interested in the engineering phases of the work.

### CURRICULUM IN CERAMIC ENGINEERING

*For the Degree of Bachelor of Science in Ceramic Engineering*

#### FIRST YEAR

Common Program for Freshmen, except that Chem. 105 and Math. 117 and 127 substituted for Chem. 104 and Math. 112, 114, and 122.

#### SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Cer. E. 101—Introduction to Ceramic Engineering | 3 | Cer. E. 102—Ceramic Processes and Equipment | 3 |
| Chem. 123—Quantitative Analysis | 5 | Geol. 130—Mineralogy for Engineers | 3 |
| Math. 137—Calculus | 3 | Math. 147—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 18 | *Total* | 18 |

#### THIRD YEAR

| | | | |
|---|---|---|---|
| Cer. E. 201—Ceramic Technology | 5 | Cer. E. 202—Ceramic Technology | 5 |
| Cer. E. 203—Principles of Drying | 3 | Cer. E. 204—Kilns, Furnaces, and Firing Operations | 3 |
| Chem. 245—Elementary Physical Chemistry | 3 | Cer. E. 221—Pyrometry | 2 |
| T.A.M. 221—Resistance of Materials | 3 | Physics 260—Heat | 3 |
| T.A.M. 223—Resistance of Materials Lab | 1 | Technical Elective | 2 or 3 |
| Approved Electives | 3 | Approved Electives | 3 |
| *Total* | 18 | *Total* | 18 or 19 |

FOURTH YEAR

| | | | |
|---|---|---|---|
| Cer. E. 211—Ceramic Bodies and Glazes | 5 | Cer. E. 212—Refractories | 2 |
| Cer. E. 271—Ceramic Engineering Design | 2 | Cer. E. 272—Ceramic Engineering Design | 3 |
| Cer. E. 299—Inspection Trip | 0 | E.E. 204—Application of Electrical Equipment | 2 |
| C.E. 260—Structural Engineering | 3 | E.E. 205—Electrical Equipment Lab | 1 |
| E.E. 202—Direct and Alternating Current Circuits and Machines | 2 | Technical Electives | 4 or 5 |
| E.E. 203—Direct and Alternating Circuits and Machine Lab | 1 | Approved Electives | 3 |
| Technical Electives | 2 | | |
| Approved Electives | 3 | | |
| *Total* | 18 | *Total* | 15 or 16 |

*Kiln Laboratory — Some of the Kilns and Furnaces for Firing Ceramic Bodies and Glazes*

## Chemical Engineering

The curricula in chemical engineering are administered by the College of Liberal Arts and Sciences as a division of the chemistry department. They are designed to make you competent to develop, design, and operate new processes, and improve existing processes, in the chemical industries. A broad training in the fundamentals of chemistry and physics, and in the application of mathematics to these sciences,

is essential before the actual courses in chemical engineering are started. Since some of the work may involve the design of heavy equipment, you also have to understand the principles of mechanical and electrical engineering. You will find some training in engineering drawing useful. Equally useful will be an ability to use both spoken and written English fluently and to read technical literature in foreign languages.

The principles of chemical engineering are based on energy and material balances, and rates of physical and chemical reactions, especially in continuous processes. These principles apply in unit operations like the handling of liquids and gases; the transfer of heat; the absorption of gases; and the processes of extraction, distillation, evaporation, and drying. In your senior year you'll solve a lot of practical problems, some of them economic, very much like those found in the modern chemical industry.

Because of the broad scope of the training in chemical engineering, you must have a good preparation in chemistry, mathematics, and foreign languages in high school if you are to reach your educational objectives in four years. An optional five-year curriculum is offered; it is recommended especially for those who do not qualify for Chem. 107 and Math. 117, and who do not have two units of high school credit in French or German. Both curricula lead to the Bachelor of Science degree in chemical engineering.

## CURRICULUM IN CHEMICAL ENGINEERING

*For the Degree of Bachelor of Science in Chemical Engineering*

### FIRST YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 107—General Chemistry and Qualitative Analysis | 5 | Chem. 108—General Chemistry and Qualitative Analysis | 5 |
| Math. 117—Combined Freshman Mathematics[1] | 5 | Math. 127—Combined Freshman Mathematics[1] | 4 |
| German, French, or Russian | 4 | German, French, or Russian | 4 |
| Rhet. 101—Rhetoric and Composition | 3 | Rhet. 102—Rhetoric and Composition | 3 |
| Physical Education | 1 | Hygiene 102 or 105—Personal and Environmental Hygiene | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 17 | *Total* | 18 |

[1] For students who do not take Math. 117 and 127, the required sequence is Math. 112 (or 111), 114 (or 115), 122, 132, and 142.

## SECOND YEAR

| | | | |
|---|---|---|---|
| Chem. 124—Quantitative Analysis | 5 | Chem. 240—Elementary Physical Chemistry | 3 |
| Math. 137—Calculus | 3 | Chem. 241—Elementary Physical Chemistry Lab. | 1 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Math. 147—Calculus | 3 |
| G.E.D. 106—Elements of Drawing | 3 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | Ch.E. 261—Stoichiometry | 3 |
| Military Science (men) | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| | | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 16 | *Total* | 17 |

## THIRD YEAR

| | | | |
|---|---|---|---|
| Chem. 234—Organic Chemistry | 5 | Chem. 336—Organic Chemistry | 3 |
| Ch.E. 267—Measurements and Instrumentation Lab. | 2 | Chem. 337—Organic Chemistry Lab. | 2 |
| Ch.E. 370—Chemical Engineering Thermodynamics | 3 | Chem. 342—Elementary Physical Chemistry | 3 |
| T.A.M. 221—Resistance of Materials | 3 | Ch.E. 371—Principles of Chemical Engineering | 4 |
| T.A.M. 223—Resistance of Materials Lab. | 1 | Ch.E. 372—Unit Operations Lab. | 2 |
| General Studies Electives[1] | 3 | General Studies Electives[1] | 3 |
| *Total* | 17 | *Total* | 17 |

## FOURTH YEAR

| | | | |
|---|---|---|---|
| Chem. 344—Principles of Chemical Thermodynamics | 2 | Ch.E. 266—Inspection Trip | ½ |
| Ch.E. 266—Inspection Trip | ½ | Ch.E. 379—Chemical Engineering Projects Lab. | 2 |
| Ch.E. 373—Principles of Chemical Engineering | 4 | Ch.E. 381—Plant Design | 3 |
| Ch.E. 374—Unit Operations Lab. | 2 | M.E. 204—Mechanical Engineering Lab. | 2 |
| Ch.E. 377—Chemical Engineering Technology | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 309—Direct and Alternating Current Lab. | 1 |
| E.E. 307—Direct and Alternating Current Lab. | 1 | Electives[2] | 4 or 5 |
| Electives[2] | 2 or 3 | | |
| *Total* | 17½ to 18½ | *Total* | 15½ to 16½ |

[1] These electives should be chosen from the Division of Humanities or Social Sciences with the approval of the advisor. The courses are intended to broaden the engineer and provide an interest and liberal education in economics, history, literature, philosophy, political science, or public speaking.

[2] Five hours of electives must be chosen with the approval of the advisor from advanced courses in chemical engineering, chemistry, physics, mathematics, or other closely allied subjects.

## OPTIONAL FIVE-YEAR CURRICULUM IN CHEMICAL ENGINEERING

*For the Degree of Bachelor of Science in Chemical Engineering*

### FIRST YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 101 or 102—General Chemistry[1] | 5 | Chem. 106—Inorganic Chemistry | 5 |
| Math. 117—Combined Freshman Mathematics[2] | 5 | Math. 127—Combined Freshman Mathematics[2] | 4 |
| German, French, or Russian | 4 | German, French, or Russian | 4 |
| Rhet. 101—Rhetoric and Composition | 3 | Rhet. 102—Rhetoric and Composition | 3 |
| Physical Education | 1 | Hygiene 102 or 105—Personal and Environmental Hygiene | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 17 | *Total* | 18 |

### SECOND YEAR

| | | | |
|---|---|---|---|
| Chem. 110—Qualitative Analysis | 5 | Chem. 124—Quantitative Analysis | 5 |
| Math. 137—Calculus | 3 | Math. 147—Calculus | 3 |
| German, French, or Russian | 4 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | German, French, or Russian | 4 |
| Physical Education | 1 | Physical Education | 1 |
| Military Science (men) | 1 | Military Science (men) | 1 |
| *Total* | 17 | *Total* | 17 |

### THIRD YEAR

| | | | |
|---|---|---|---|
| Chem. 234—Organic Chemistry | 5 | Chem. 336—Organic Chemistry | 3 |
| Chem. 240—Elementary Physical Chemistry | 3 | Chem. 337—Organic Chemistry Lab. | 2 |
| Chem. 241—Elementary Physical Chemistry Lab. | 1 | Chem. 342—Elementary Physical Chemistry | 3 |
| G.E.D. 106—Elements of Drawing | 3 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Ch.E. 261—Stoichiometry | 3 | Ch.E. 370—Chemical Engineering Thermodynamics | 3 |
| General Studies Electives[3] | 3 | General Studies Electives[3] | 3 |
| *Total* | 18 | *Total* | 16 |

### FOURTH YEAR

| | | | |
|---|---|---|---|
| Chem. 344—Principles of Chemical Thermodynamics | 2 | Ch.E. 371—Principles of Chemical Engineering | 4 |
| Ch.E. 267—Measurements and Instrumentation | 2 | Ch.E. 372—Unit Operations Lab. | 2 |
| Ch.E. 377—Chemical Engineering Technology | 3 | M.E. 204—Mechanical Engineering Lab. | 2 |
| T.A.M. 221—Resistance of Materials | 3 | Electives[3] | 8 |
| T.A.M. 223—Resistance of Materials Lab. | 1 | | |
| Electives[3] | 6 | | |
| *Total* | 17 | *Total* | 16 |

## FIFTH YEAR

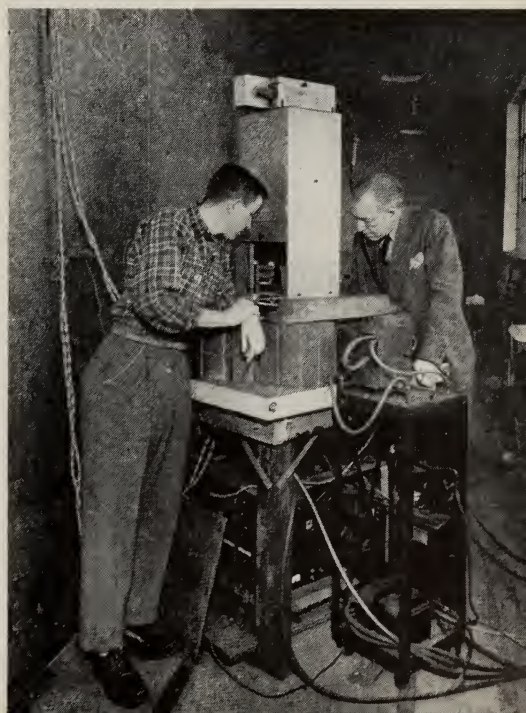
| | | | |
|---|---|---|---|
| Ch.E. 266—Inspection Trip | ½ | Ch.E. 266—Inspection Trip | ½ |
| Ch.E. 373—Principles of Chemical Engineering | 4 | Ch.E. 381—Plant Design | 3 |
| Ch.E. 374—Unit Operations Lab. | 2 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| Ch.E. 379—Chemical Engineering Projects Lab. | 2 | E.E. 309—Direct and Alternating Current Lab. | 1 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | Professional Electives[4] | 8 |
| E.E. 307—Direct and Alternating Current Lab. | 1 | | |
| Professional Electives[4] | 3 | | |
| *Total* | 15½ | *Total* | 15½ |

[1] Students who qualify for Chem. 107 should take the Chem. 107, 108, 124, and 240 sequence rather than Chem. 101, 106, 110, and 124, and thus have 5 additional hours of advanced electives.

[2] For students who do not take Math. 117 and 127, the required sequence is Math. 112 (or 111), 114 (or 115), 122, 132, and 142.

[3] These electives should be chosen from the Division of Humanities or Social Sciences with the approval of the advisor. The courses are intended to broaden the engineer and provide an interest and liberal education in economics, history, literature, philosophy, political science, or public speaking. With the proper choice of these electives the student may qualify for the degree of Bachelor of Arts or Bachelor of Science at the end of the fourth year.

[4] Professional electives must be chosen with the approval of the advisor from advanced courses in chemical engineering, chemistry, physics, mathematics, or other closely allied subjects.



*Wilson Cloud Chamber Apparatus*

## Civil Engineering

The curriculum in civil engineering offers you a systematic training in the principles and procedures used in professional practice. Emphasis is placed on basic principles and design procedures rather than on routine computations, or on special techniques and information, which you can readily get after graduation when you go to work in engineering offices and on construction jobs. There are courses dealing with the design and construction of bridges, buildings, dams, retaining walls, foundations, aircraft structures, and airports; the design, construction, and operation of water supply and sewage disposal systems, highways, and railways; methods and engineering works involved in flood control and drainage; and the preparation of cost estimates, contracts, and specifications. In your senior year you get to specialize some in the more important branches of civil engineering through options in structures, including aircraft structures; transportation by highway, railway, and airway; and hydraulic engineering. A general option is offered so you can choose some courses to suit other special interests you may have.

A summer surveying camp provides field instruction in surveying, between the freshman and sophomore years, and an arrangement is in effect with the Illinois State Highway Department under which you may get engineering experience, with pay, during the next two summers in college.

In addition to the above curriculum, the civil engineering department also administers the curriculum in sanitary engineering and, along with the College of Medicine, the curriculum in public health engineering.

### CURRICULUM IN CIVIL ENGINEERING

*For the Degree of Bachelor of Science in Civil Engineering*

#### FIRST YEAR

Common Program for Freshmen

C.E. 101, 3 hours, and C.E. 102, 4 hours, are required courses which will be taught at the Summer Surveying Camp following the first year.

## SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| C.E. 103—Route Surveying | 3 | Geol. 150—Geology for Engineers[1] | 3 |
| C.E. 160—Building Construction | 3 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Physical Education | 1 | Econ. 108—Elements of Economics, or Speech 101—Principles of Effective Speaking[1] | 3 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 18 | *Total* | 18 |

NOTE: Transfer students who have completed two years of work and who have not had any surveying should take C.E. 111, 112, and 203. Special programs can be arranged for these students and others who have not had C.E. 160 or T.A.M. 150, so that they can graduate in two years in certain options, provided they present an equivalent amount of appropriate credit.

## THIRD YEAR

| | | | |
|---|---|---|---|
| C.E. 230—Materials of Construction | 2 | C.E. 220—Highways | 3 |
| C.E. 235—Plain Concrete | 2 | C.E. 262—Structural Analysis | 3 |
| C.E. 261—Structural Analysis | 4 | C.E. 263—Elementary Structural Design | 2 |
| M.E. 201—Mechanical Power Equipment | 3 | T.A.M. 232—Fluid Mechanics | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | T.A.M. 234—Laboratory in Fluid Mechanics | 1 |
| T.A.M. 221—Resistance of Materials | 3 | E.E. 202—Direct and Alternating Current Circuits and Machines, or Approved Electives[2] | 2 |
| T.A.M. 223—Resistance of Materials Lab | 1 | E.E. 203—Direct and Alternating Circuits and Machines Lab., or Approved Electives[2] | 1 |
| | | Approved Electives[2] | 2 |
| *Total* | 18 | *Total* | 17 |

## FOURTH YEAR

### General Option

| | | | |
|---|---|---|---|
| C.E. 240—Water Supply | 4 | C.E. 241—Sewerage | 3 |
| C.E. 264—Structural Design | 5 | C.E. 270—Earth and Masonry Structures | 3 |
| C.E. 290—Contracts and Specifications | 2 | C.E. 296—Professional Practice | 0 |
| C.E. 295—Professional Practice | 0 | Technical Electives | 5 |
| C.E. 299—Inspection Trip | 0 | Approved Electives | 4 |
| Technical Electives | 3 | | |
| *Total* | 14 | *Total* | 15 |

[1] Eight hours of credit in foreign language (French, German, or Spanish) may be substituted for Geol. 150 (3 hours), Econ. 108 or Speech 101 (3 hours), and approved electives (2 hours).

[2] Replace with Chem. 122, Elementary Quantitative Analysis, in the sanitary engineering curriculum.

### Construction Option

C.E. 237—Estimates and Costs.....2
C.E. 238—Construction Equipment and Methods.....3
C.E. 248—Water Supply and Sewerage.....4
C.E. 264—Structural Design.....5
C.E. 295—Professional Practice.....0
C.E. 299—Inspection Trip.....0
*Total*.....14

C.E. 239—Construction Planning and Management.....4
C.E. 270—Earth and Masonry Structures.....3
C.E. 290—Contracts and Specifications.....2
C.E. 296—Professional Practice.....0
Eng. 230—Labor Relations.....3
Approved Electives.....3
*Total*.....15

### Highway Option

C.E. 222—Highway and Municipal Design.....4
C.E. 227—Terminals.....2
C.E. 231—Advanced Highway Materials.....2
C.E. 248—Water Supply and Sewerage.....4
C.E. 290—Contracts and Specifications.....2
C.E. 295—Professional Practice.....0
C.E. 299—Inspection Trips.....0
*Total*.....14

C.E. 223—Traffic Engineering.....3
C.E. 232—Engineering Properties of Soils.....2
C.E. 264—Structural Design.....5
C.E. 270—Earth and Masonry Structures.....3
C.E. 296—Professional Practice.....0
Approved Electives.....2
*Total*.....15

### Hydraulic Option

C.E. 248—Water Supply and Sewerage.....4
C.E. 250—Hydrology.....3
C.E. 252—Water Resources, Planning, and Development.....3
C.E. 264—Structural Design.....5
C.E. 295—Professional Practice.....0
C.E. 299—Inspection Trip.....0
*Total*.....15

C.E. 255—Water Power.....3
C.E. 270—Earth and Masonry Structures.....3
C.E. 290—Contracts and Specifications.....2
C.E. 296—Professional Practice.....0
C.E. 351—Drainage and Flood Control.....3
Approved Electives.....3
*Total*.....14

### Railway Option

C.E. 226—Railway Location and Operation.....3
C.E. 227—Terminals.....2
C.E. 264—Structural Design.....5
C.E. 270—Earth and Masonry Structures.....3
C.E. 290—Contracts and Specifications.....2
C.E. 295—Professional Practice.....0
C.E. 299—Inspection Trip.....0
*Total*.....15

C.E. 225—Railway Construction and Maintenance.....3
C.E. 229—Signals.....2
C.E. 232—Engineering Properties of Soils.....2
C.E. 248—Water Supply and Sewerage.....4
C.E. 296—Professional Practice.....0
Econ. 384—Economics of Transportation, or C.E. 238—Construction Equipment and Methods.....3
*Total*.....14

STRUCTURAL OPTION

| | | | |
|---|---|---|---|
| C.E. 264—Structural Design | 5 | C.E. 248—Water Supply and Sewerage | 4 |
| C.E. 270—Earth and Masonry Structures | 3 | C.E. 265—Structural Design | 4 |
| C.E. 295—Professional Practice | 0 | C.E. 271—Foundations | 2 |
| C.E. 299—Inspection Trip | 0 | C.E. 290—Contracts and Specifications | 2 |
| C.E. 361—Statically Indeterminate Structures[1] | 3 | C.E. 296—Professional Practice | 0 |
| Approved Electives | 3 | C.E. 362—Statically Indeterminate Structures[1] | 3 |
| *Total* | 14 | *Total* | 15 |

[1] C.E. 386, Advanced Aircraft Structures, may be substituted for either 361 or 362; or C.E. 386 and 387, Advanced Aircraft Structures, may be substituted for both.

## CURRICULUM IN SANITARY ENGINEERING

*For the Degree of Bachelor of Science in Sanitary Engineering*

### FIRST THREE YEARS

The first three years are the same as the curriculum in civil engineering except that the substitution of Chem. 122 for the electives as shown on page 61 should be made in the sixth semester.

### FOURTH YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Bact. 104—Introductory Bacteriology | 3 | Chem. 132—Elementary Organic Chemistry | 3 |
| C.E. 240—Water Supply | 4 | C.E. 241—Sewerage | 3 |
| C.E. 270—Earth and Masonry Structures | 3 | C.E. 264—Structural Design | 5 |
| C.E. 295—Professional Practice | 0 | C.E. 296—Professional Practice | 0 |
| C.E. 299—Inspection Trip | 0 | C.E. 345—Public Health Engineering | 3 |
| C.E. 344—Water and Sewage Treatment | 5 | | |
| *Total* | 15 | *Total* | 14 |

*Class Instruction in Descriptive Geometry*

## CURRICULUM IN PUBLIC HEALTH ENGINEERING

*For the Degree of Bachelor of Science in Public Health Engineering*

### FIRST FOUR YEARS

The first four years are the same as the sanitary option in civil engineering or the sanitary engineering curriculum. Students who have received the bachelor's degree in sanitary engineering or its equivalent at a recognized college of engineering are admitted to the fifth year in this curriculum providing they have had the necessary prerequisites for the particular courses required at the University. The work for the first semester of the fifth year is offered at Urbana, and the second half of the year is offered at the College of Medicine in Chicago.

### FIFTH YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 247—Elementary Physical Chemistry | 4 | C.E. 493—Special Problems | 3 |
| Chem. 326—Chemical Analysis and Treatment of Water | 3 | P.H. 1—Bacteriology and Protozoology | 6 |
| C.E. 345—Public Health Engineering | 3 | P.H. 4—Preventive Medicine | 2 |
| Zool. 101—General Zoology | 4 | P.H. 12—Industrial Hygiene | 1 |
| Approved Electives (D.P. 350, Entom. 103, Math. 161, M.E. 253) | 5 | P.H. 50—Public Health | 1 |
| | | P.H. 73—Advanced Public Health | 2 |
| | | Pharmacology, or Approved Electives | 3 |
| *Total* | 19 | *Total* | 18 |

## Electrical Engineering

The first two years of the curriculum in electrical engineering are just about the same as the first two years in other engineering curricula. Instruction includes the principles of mathematics, physical science, engineering drawing, and shop practice.

Your actual work in electrical engineering subjects begins in your second year with courses in illuminating engineering and secondary power distribution and with an introduction to electrodynamics. In the first semester of the third year a course in circuit analysis is accompanied by laboratory work which emphasizes basic principles.

Beginning with the second semester of the third year, the courses are arranged in three options covering the fields of communication and electronics, illumination, and power. These options are designed, not to make you a specialist, but rather to give you a wide background in the fundamental theory and methods of attack on some of the more difficult problems in your chosen field. In each option technical courses and accompanying laboratory exercises, covering the generation, transmission, distribution, radiation, measurement, and utilization of elec-

trical energy in all frequency ranges, give you a broad general training, supplemented by other courses which emphasize the fields of the options.

If you show exceptional ability and interest during your freshman and sophomore years, and if you present an integrated program of study, you get a chance to do individual work — particularly experimental investigation — in both the third and fourth years. In other words, even though the options say exactly what you have to take for a degree, you may instead pursue a program fitted to your particular needs — if it is approved.

## CURRICULUM IN ELECTRICAL ENGINEERING

*For the Degree of Bachelor of Science in Electrical Engineering*

### FIRST YEAR

Common Program for Freshmen

### SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| E.E. 120—Illumination Engineering and Secondary Power Distribution | 3 | E.E. 126—Introduction to Electrodynamics | 3 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| M.E. 184—Metal Processing, or Speech 101—Principles of Effective Speaking[1] | 3 | Speech 101—Principles of Effective Speaking, or M.E. 184—Metal Processing[1] | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 154—Analytical Mechanics | 4 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 18 | *Total* | 20 |

### THIRD YEAR

| | |
|---|---|
| E.E. 320—Introduction to Circuit Analysis | 4 |
| E.E. 321—Circuit Lab. | 2 |
| Math. 345—Differential Equations and Orthogonal Functions | 3 |
| M.E. 202—Thermodynamics | 3 |
| T.A.M. 221—Resistance of Materials | 3 |
| T.A.M. 223—Resistance of Materials Lab. | 1 |
| Non-technical Electives | 3 |
| *Total* | 19 |

For this and succeeding semesters, courses are arranged in options in the general fields of communication and electronics, illumination, and power.

[1] Students intending to select the option in illumination, take Speech 101 the first semester and an approved elective the second semester.

## *Communications and Electronics Option*

### THIRD YEAR

This semester is the same for all options (see above).

E.E. 330—Electrical Machinery....4
E.E. 331—Electrical Machinery Lab....2
E.E. 342—Electronics....3
E.E. 343—Electronics Lab....1
E.E. 350—Communication Networks and Lines....3
E.E. 351—Communication Networks and Lines Lab....1
Non-technical Electives....3
*Total*....17

### FOURTH YEAR

E.E. 284—Economical Design of Electrical Systems....3
E.E. 290—Seminar....1
E.E. 299—Inspection Trip....0
E.E. 324—Measurements in Electrical Engineering....3
E.E. 344—Electronics....3
E.E. 345—Electronics Lab....1
E.E. 352—Communication Engineering I....3
E.E. 353—Communication Engineering I Lab....1
Non-technical Electives....3
*Total*....18

E.E. 292—Seminar....1
E.E. 354—Communication Engineering II....3
E.E. 355—Communication Engineering II Lab....1
E.E. 389—Communication Design...3
Approved Electives....4
Non-technical Electives....3
*Total*....15

## *Illumination Option*

### THIRD YEAR

This semester is the same for all options.

Arch. 216—Architecture and Civilization of Renaissance Europe....2
E.E. 330—Electrical Machinery....4
E.E. 331—Electrical Machinery Lab....2
Psych. 100—Introduction to Psychology....4
Physics 270—Intermediate Light, or E.E. 360—Elements of Illuminating Engineering Design....4
Physiol. 101—Mammalian Physiology....3
*Total*....19

### FOURTH YEAR

Arch. 217—Architecture and Civilization of the Americas to 1870....2
Marketing 271—Salesmanship....2
E.E. 290—Seminar....1
E.E. 362—Principles of Illuminating Engineering....4
E.E. 363—Illumination and Photometry Lab....1
E.E. 340—Electronics....4
E.E. 341—Electronics Lab....1
E.E. 299—Inspection Trip....0
*Total*....15

Arch. 218—Architecture and Civilization of the Americas and Europe since 1870....2
Marketing 373—Sales Management..2
E.E. 292—Seminar....1
E.E. 324—Measurements in Electrical Engineering....3
E.E. 364—Illumination Design and Economics....4
E.E. 365—Illumination Design Lab...1
E.E. 366—Illumination Sources....3
*Total*....16

## *Power Option*

### THIRD YEAR

This semester is the same for all options.

E.E. 324—Measurements in Electrical Engineering.....3
E.E. 332—Alternating Current Apparatus.....4
E.E. 333—Alternating Current Apparatus Lab.....2
M.E. 203—Power Plant Equipment..3
M.E. 204—Mechanical Engineering Lab.....2
Non-technical Electives.....3
*Total*.....17

### FOURTH YEAR

E.E. 290—Seminar.....1
E.E. 299—Inspection Trip.....0
E.E. 334—Alternating Current Apparatus.....3
E.E. 335—Alternating Current Apparatus Lab.....2
E.E. 340—Electronics.....4
E.E. 341—Electronics Lab.....1
E.E. 387—Electrical Design.....3
Non-technical Electives.....3
*Total*.....17

E.E. 284—Economical Design of Electrical Systems.....3
E.E. 292—Seminar.....1
E.E. 336—Direct Current Apparatus.....3
E.E. 337—Direct Current Apparatus Lab.....2
Approved Electives.....4
Non-technical Electives.....3
*Total*.....16

*The Communications Laboratory for measuring Electrical Network Circuits and Transmission Lines*

## General Engineering

The general engineering curriculum, administered directly by the College, provides a fundamental engineering training with some emphasis on design and a fixed requirement of 15 hours in economics, corporations, finance, engineering law, and labor relations. Specialization in any field of your choice is permitted by means of the liberal provisions for elective studies, as well as by an option which lets you choose either structural or machine design. The curriculum is intended for those of you who do not care to follow the more technical phases of engineering practice but who desire to ally yourselves with industrial and commercial development in the fields of management, operation, and construction — preparation for which is founded on engineering facts and disciplines, supplemented by economic and social operations.

### CURRICULUM IN GENERAL ENGINEERING

*For the Degree of Bachelor of Science in General Engineering*

This curriculum is intended for students who do not wish to pursue the more specialized engineering curricula, but who wish to secure a sound education in engineering principles and their application. Fifteen hours of work in economics, engineering law, industrial relations, etc., are required, and 8 to 14 hours of free electives are allowed. The mechanical engineering design sequence of courses, namely, M.E. 221, 224, and 271, plus 3 hours of approved electives will be accepted in place of C.E. 261, 262, 263, and 264 in the third and fourth years. A sales engineering option can be readily planned within the elective framework of the curriculum.

FIRST YEAR

Common Program for Freshmen

SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Econ. 108—Elements of Economics | 3 | Speech 101—Principles of Effective Speaking | 3 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| M.E. 183—Materials Casting, or C.E. 115—General Surveying | 3 | C.E. 115—General Surveying, or M.E. 183—Materials Casting | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 18 | *Total* | 18 |

THIRD YEAR

| | | | |
|---|---|---|---|
| Accy. 201—Fundamentals of Accounting | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | E.E. 309—Direct and Alternating Current Laboratory | 1 |
| E.E. 307—Direct and Alternating Current Laboratory | 1 | M.E. 184—Metal Processing | 3 |
| M.E. 202—Thermodynamics | 3 | Econ. 257—Corporation Finance | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | Options | 8 |
| T.A.M. 221—Resistance of Materials | 3 | | |
| T.A.M. 223—Resistance of Materials Lab. | 1 | | |
| *Total* | 17 | *Total* | 18 |

FOURTH YEAR

| | | | |
|---|---|---|---|
| Eng. 230—Labor Relations, or Eng. 239—Industrial Relations | 3 | Eng. 292—Engineering Law | 3 |
| G.E. 299—Inspection Trip | 0 | M.E. 208—Mechanical Engineering Lab. | 3 |
| M.E. 203—Power Plant Equipment | 3 | Options | 12 |
| Options | 12 | | |
| *Total* | 18 | *Total* | 18 |

## *Structural Design Option*

THIRD YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| | | C.E. 261—Structural Analysis | 4 |
| | | T.A.M. 232—Fluid Mechanics | 3 |
| | | T.A.M. 234—Lab. in Fluid Mech. | 1 |
| | | *Total* | 8 |

FOURTH YEAR

| | | | |
|---|---|---|---|
| C.E. 262—Structural Analysis | 3 | C.E. 264—Structural Design | 5 |
| C.E. 263—Elementary Structural Design | 2 | M.E. 234—Heat Treatment of Metals or Met. 230—Engineering Metallurgy | 3 |
| Geol. 150—Geology for Engineers | 3 | Approved Electives | 4 |
| Approved Electives | 4 | | |
| *Total* | 12 | *Total* | 12 |

## *Mechanical Design Option*

THIRD YEAR

| | | | |
|---|---|---|---|
| | | M.E. 221—Mechanics of Machinery | 5 |
| | | Approved Electives | 3 |
| | | *Total* | 8 |

FOURTH YEAR

| | | | |
|---|---|---|---|
| M.E. 224—Design of Machine Elements | 3 | M.E. 241—Mechanical Engineering Design | 3 |
| M.E. 234—Heat Treatment of Metals or Met. 230—Engineering Metallurgy | 3 | T.A.M. 232—Fluid Mechanics | 3 |
| Approved Electives | 6 | T.A.M. 234—Laboratory in Fluid Mechanics | 1 |
| | | Approved Electives | 5 |
| *Total* | 12 | *Total* | 12 |

## Mechanical Engineering

The curriculum in mechanical engineering presents the theory and practice of the generation, transmission, and utilization of power, and the theory of operation, design, testing, and construction of all types of machines. In the laboratories, emphasis is placed on the engineering and economic principles of machine design, operation, performance, and construction, and on the problems of production management.

The first year of the mechanical engineering curriculum is the same as that of the other curricula in engineering. The second year is the same, no matter which option in this curriculum you're planning to take. During the third and fourth years you can get a wide variety of optional course sequences. This variety permits some emphasis on one of the following phases: heat power, machine design, production, research, air conditioning and refrigeration, petroleum production, and railway motive power. In addition to these special options, a general option is provided which permits you to select 24 semester hours consisting of either 1) electives cutting across several of the special options we've named, or 2) courses in general education, commerce, the social sciences, literature, and the humanities. All the optional curricula contain the same strong basic courses in science, mathematics, mechanics, and engineering fundamentals extending throughout the four years.

### CURRICULUM IN MECHANICAL ENGINEERING

*For the Degree of Bachelor of Science in Mechanical Engineering*

#### FIRST YEAR

Common Program for Freshmen

#### SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| M.E. 171—Mechanism | 2 | M.E. 184—Metal Processing, or M.E. 183—Materials Casting | 3 |
| M.E. 183—Materials Casting, or M.E. 184—Metal Processing | 3 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | T.A.M. 156—Analytical Mechanics (Statics and Dynamics) | 5 |
| Physical Education | 1 | Physical Education | 1 |
| Military Science (men) | 1 | Military Science (men) | 1 |
| *Total* | 17 | *Total* | 18 |

THIRD YEAR

| | | | |
|---|---|---|---|
| M.E. 205—Thermodynamics | 3 | M.E. 206—Thermodynamics | 3 |
| M.E. 223—Mechanics of Machinery | 3 | M.E. 207—Power Plant Equipment | 3 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | M.E. 208—Mechanical Engineering Lab. | 3 |
| E.E. 307—Direct and Alternating Current Lab. | 1 | M.E. 224—Design of Machine Elements | 3 |
| T.A.M. 221—Resistance of Materials | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| Options | 6 | T.A.M. 223—Resistance of Materials Lab. | 1 |
| | | Options | 3 |
| *Total* | 19 | *Total* | 19 |

FOURTH YEAR

| | | | |
|---|---|---|---|
| M.E. 255—Mechanical Engineering Lab. | 3 | M.E. 260—Heating, Ventilating, and Air Conditioning[1] | 3 |
| M.E. 271—Design of Machine Elements | 3 | M.E. 291—Mechanical Engineering Seminar | 1 |
| M.E. 299—Inspection Trip | 0 | Options | 12 |
| Options | 12 | | |
| *Total* | 18 | *Total* | 16 |

[1] To be taken in the first semester of the air conditioning and refrigeration option in place of approved electives (3 hours).

All mechanical engineering students take the same subjects the first two years. During the third and fourth years students take the courses specified above and select, with guidance from the department advisors, one of the following options.

## *General Option*

This option permits selection of the courses to meet the needs of students whose interests differ from those who choose special options.

THIRD YEAR

| | | | |
|---|---|---|---|
| Approved Electives | 3 | Approved Electives | 3 |
| Non-technical Electives | 3 | | |

FOURTH YEAR

| | | | |
|---|---|---|---|
| M.E. 234—Heat Treatment of Metals | 3 | Departmental Electives | 3 |
| Departmental Electives | 3 | Approved Electives | 6 |
| Approved Electives | 3 | Non-technical Electives | 3 |
| Non-technical Electives | 3 | | |

## *Aeronautical Option*

This option is designed for those mechanical engineering students who may be interested in the aircraft industry.

THIRD YEAR

| | | | |
|---|---|---|---|
| Aero. E. 211—Aerodynamics | 3 | Aero. E. 220—Aircraft Structures | 3 |
| Math. 387—Introduction to Applied Mathematics, or Math. 345—Differential Equations and Orthogonal Functions, or Math. 341—Differential Equations | 3 | | |

FOURTH YEAR

M.E. 234—Heat Treatment of Metals....3
M.E. 256—Internal Combustion Engines....3
Aero. E. 221—Aircraft Structures...3
Non-technical Electives....3
M.E. 258—Combustion Engine and Turbine Lab....3
Aero. E. 261—Aerodynamics Lab....2
Aero. E. 264—Aircraft Structures Lab....2
Departmental Electives....3
Non-technical Electives....2

## *Air Conditioning and Refrigeration Option*

This option provides for those interested in heating, ventilating, air conditioning, and refrigeration.

THIRD YEAR

T.A.M. 232—Fluid Mechanics....3
Non-technical Electives....3
Approved Electives....3

FOURTH YEAR

M.E. 234—Heat Treatment of Metals....3
M.E. 254—Heat Transfer....3
M.E. 260—Heating, Ventilating, and Air Conditioning....3
Non-technical Electives....3
M.E. 259—Refrigeration Engineering....3
M.E. 261—Heating, Ventilating, and Air Conditioning Design....3
Approved Electives....6
Non-technical Electives....3

## *Design Option*

This option provides for specialization in mechanical engineering design.

THIRD YEAR

Approved Electives....3
Non-technical Electives....3
M.E. 234—Heat Treatment of Metals....3

FOURTH YEAR

M.E. 284—Welding Engineering....3
T.A.M. 311—Mechanical Vibrations....3
T.A.M. 321—Advanced Mechanics of Materials, or M.E. 272—Analytical Design of High-Speed Engines....3
Non-technical Electives....3
M.E. 272—Analytical Design of High-Speed Engines, or T.A.M. 312—Mechanical Vibrations....3
M.E. 273—Machine Design....3
M.E. 282—Tool Engineering....3
Non-technical Electives....3

## *Petroleum Production Option*

This option is designed for those students interested in the mechanical engineering aspects of petroleum production.

THIRD YEAR

Geol. 150—Geology for Engineers...3
T.A.M. 232—Fluid Mechanics....3
Geol. 102—Historical Geology....3

FOURTH YEAR

M.E. 234—Heat Treatment of Metals....3
M.E. 371—Petroleum Production Engineering....3
Geol. 246—Applied Petroleum Geology....3
Non-technical Electives....3
M.E. 372—Petroleum Production Engineering....3
Geol. 247—Applied Petroleum Geology....3
C.E. 115—General Surveying....3
Non-technical Electives....3

## *Power Option*

This option is for those students whose interests lie in the field of steam and gas power.

THIRD YEAR

T.A.M. 232—Fluid Mechanics.....3
Non-technical Electives.....3
M.E. 234—Heat Treatment of Metals.....3

FOURTH YEAR

M.E. 254—Heat Transfer.....3
M.E. 256—Internal Combustion Engines.....3
T.A.M. 311—Mechanical Vibrations.....3
Non-technical Electives.....3
M.E. 257—Gas Turbines.....3
M.E. 258—Combustion Engine and Turbine Lab.....3
M.E. 274—Power Plant Design.....3
Non-technical Electives.....3

## *Production Option*

This option provides emphasis on the production engineering aspects of mechanical engineering to meet the needs of those students planning on a career in the manufacturing industry.

THIRD YEAR

M.E. 232—Motion and Time Study..3
Econ. 108—Elements of Economics..3
M.E. 234—Heat Treatment of Metals.....3

FOURTH YEAR

M.E. 231—Advanced Metal Processing.....3
M.E. 281—Production Control.....3
M.E. 284—Welding Engineering....3
Non-technical Electives.....3
M.E. 282—Tool Engineering.....3
M.E. 283—Industrial Plant Design..3
Approved Electives.....3
Non-technical Electives.....3

## *Research Option*

This option is intended for students interested in research and development.

THIRD YEAR

Math. 387—Introduction to Applied Mathematics, or Math. 345—Differential Equations and Orthogonal Functions, or Math. 341—Differential Equations.....3
T.A.M. 232—Fluid Mechanics.....3
M.E. 234—Heat Treatment of Metals.....3

FOURTH YEAR

M.E. 254—Heat Transfer.....3
M.E. 297—Experimental Investigations.....3
Non-technical Electives.....6
M.E. 298—Thesis, or Approved Elective.....3
T.A.M. 321—Advanced Mechanics of Materials, or E.E. 212—Electronics.....3
T.A.M. 311—Mechanical Vibrations.....3
Non-technical Electives.....3

*Railway Option*

This option permits specialization in railway mechanical engineering.

THIRD YEAR

T.A.M. 232—Fluid Mechanics.....3
Non-technical Electives.....3
M.E. 234—Heat Treatment of Metals.....3

FOURTH YEAR

M.E. 231—Advanced Metal Processing.....3
M.E. 256—Internal Combustion Engines.....3
M.E. 361—Railway Motive Power Equipment.....3
Non-technical Electives.....3
M.E. 259—Refrigeration Engineering.....3
M.E. 362—Railway Motive Power Operation.....3
M.E. 274—Power Plant Design.....3
Non-technical Electives.....3

## Mining and Metallurgical Engineering

The training in mining engineering and metallurgical engineering is presented in two distinct curricula, as follows:

*Mining Engineering.* — The curriculum in mining engineering is designed to teach you the fundamental engineering problems dealing with getting coal and minerals out of the earth, and to teach you the preliminary preparation of coal and minerals for use in our civilization. In addition to the basic freshman and sophomore courses, the curriculum also includes specialized courses in mine surveying, mining methods, prospecting, mine examination, mine ventilation, coal preparation, mineral dressing, mine administration, and design of mine plants. Interwoven throughout the curriculum is a series of required courses which provides you with a broad engineering background. You can also take elective courses in order to satisfy your particular needs.

*Metallurgical Engineering.* — The curriculum in metallurgical engineering has been designed to give you thorough instruction in the engineering fundamentals of the three main divisions of metallurgy — chemical, mechanical, and physical — with the emphasis placed on the third. After the first two years, which are essentially the same as in all engineering curricula, the technical courses provide you with specialized work in ferrous and non-ferrous process metallurgy, metallurgy of deep drawing and pressing, physical metallurgy, ferrous and non-ferrous metallography, physics of metals, electrometallurgy, heat treatment, fuels and furnaces, and alloy steels. Again the elective courses give you an opportunity to fulfill your particular requirements.

## CURRICULUM IN MINING ENGINEERING

*For the Degree of Bachelor of Science in Mining Engineering*

### FIRST YEAR

Common Program for Freshmen

### SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Geol. 150—Geology for Engineers | 3 | Geol. 130—Mineralogy for Engineers | 3 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Min. E. 151—Elements of Mining | 4 | Min. E. 152—Fuels | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| *Total* | 19 | *Total* | 18 |

### THIRD YEAR

| | | | |
|---|---|---|---|
| C.E. 115—General Surveying | 3 | E.E. 308—Direct and Alternating Current Apparatus | 3 |
| Econ. 108—Elements of Economics | 3 | E.E. 309—Direct and Alternating Current Lab. | 1 |
| E.E. 306—Direct and Alternating Current Circuits | 3 | Geology Elective | 3 |
| E.E. 307—Direct and Alternating Current Lab. | 1 | M.E. 201—Steam, Air, and Gas Machinery | 3 |
| T.A.M. 211—Analytical Mechanics (Dynamics) | 3 | Min. E. 202—Mine Ventilation | 2 |
| T.A.M. 232—Fluid Mechanics | 3 | Min. E. 204—Mine Surveying | 2 |
| T.A.M. 234—Laboratory in Fluid Mechanics | 1 | T.A.M. 221—Resistance of Materials | 3 |
| | | T.A.M. 223—Resistance of Materials Lab. | 1 |
| *Total* | 17 | *Total* | 18 |

### SUMMER

First and Second Weeks

Min. E. 205—Summer Mine Surveying . . . . . 2 hours

### FOURTH YEAR

| | | | |
|---|---|---|---|
| Min. E. 251—Mine Administration | 3 | Econ. 240—Labor Problems, or Econ. 248—Personnel Administration | 3 |
| Min. E. 253—Principles of Mining Methods | 4 | Met. E. 230—Engineering Metallurgy | 3 |
| Min. E. 255—Mineral Dressing | 3 | Min. E. 256—Mine Examination and Valuation | 2 |
| Min. E. 257—Haulage, Hoisting, and Pumping | 4 | Min. E. 258—Mining Design | 3 |
| Min. E. 299—Inspection Trip | 0 | Min. E. 260—Coal Preparation | 2 |
| Min. E. 351—Geophysics of Mining | 3 | Min. E. 396—Seminar | 1 |
| | | Approved Elective | 2 |
| *Total* | 17 | *Total* | 16 |

## CURRICULUM IN METALLURGICAL ENGINEERING

*For the Degree of Bachelor of Science in Metallurgical Engineering*

This curriculum is intended for the training of industrial metallurgists and those who wish to engage in advanced study and research either in operational processes or in various problems involving physical and chemical phases of metallurgy.

### FIRST YEAR

Common Program for Freshmen, except that Chem. 105 and G.E.D. 106 are substituted for Chem. 104 and G.E.D. 101.

### SECOND YEAR

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| Chem. 123—Quantitative Analysis for Engineers | 5 | Math. 142—Calculus | 3 |
| Math. 132—Calculus | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Met. E. 150—Introduction to Metallurgy | 3 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| | | Military Science (men) | 1 |
| | | Approved Electives | 3 |
| *Total* | 17 | *Total* | 18 |

### THIRD YEAR

| | | | |
|---|---|---|---|
| Chem. 245—Elementary Physical Chemistry | 3 | Chem. 246—Elementary Physical Chemistry | 3 |
| Met. E. 201—Principles of Physical Metallurgy | 3 | Met. E. 208—Ferrous Metallography | 3 |
| Met. E. 203—Physical Metallurgy Lab. | 1 | Met. E. 210—Ferrous Metallography Lab. | 3 |
| Met. E. 205—Metallurgy of Iron and Steel | 3 | Met. E. 214—Electrometallurgy | 2 |
| Met. E. 207—Metallurgical Calculations | 2 | Met. E. 216—Electrometallurgy Lab. | 1 |
| Cer. E. 221—Pyrometry | 2 | T.A.M. 221—Resistance of Materials | 3 |
| Approved Electives | 3 | T.A.M. 223—Resistance of Materials Lab. | 1 |
| | | Approved Electives | 3 |
| *Total* | 17 | *Total* | 19 |

*Arc Welding in Metallurgical Laboratories*

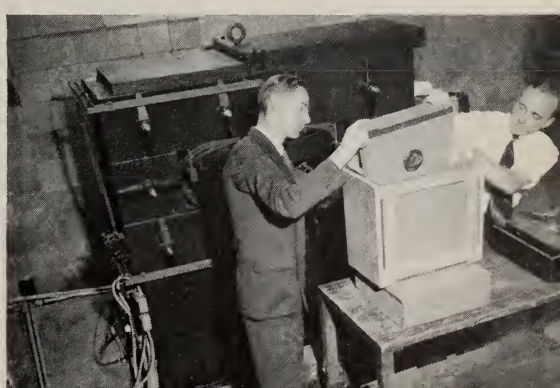
FOURTH YEAR

E.E. 202—Direct and Alternating Current Circuits and Machines....2
E.E. 203—Direct and Alternating Current Circuits and Machines Lab.....1
Met. E. 251—Nonferrous Metallography.....3
Met. E. 253—Nonferrous Metallography Lab.....3
Met. E. 255—Metallurgy of Nonferrous Metals.....3
Met. E. 295—Metallurgical Seminar..1
Met. E. 299—Inspection Trip.....0
T.A.M. 323—Advanced Laboratory in Materials Testing.....3
Approved Electives.....3
*Total*.....19

E.E. 204—Applications of Electrical Equipment.....2
E.E. 205—Electrical Equipment Lab.....1
Met. E. 256—Metallurgy of Deep Drawing and Pressing.....3
Met. E. 258—Alloy Steels.....3
Met. E. 260—Advanced Physical Metallurgy Lab.....3
Met. E. 296—Metallurgy Seminar...1
Approved Electives.....4 or 5
*Total*.....17 or 18

## Department of General Engineering Drawing

This department is one of the two in the College of Engineering which do not offer curricula leading to a degree but which provide both basic and advanced courses necessary to engineering students in all curricula. The courses in this department are intended to develop the theory, skill, and technique which you need for the preparation and understanding of engineering plans and designs by means of the graphical language. Both lettering and drawing are given in elementary and advanced courses. The work in descriptive geometry is coordinated with the other drawing courses and includes practical problems in engineering. The constant use of methods of exact geometrical analysis necessarily employed in this subject, combined with the steady development of your powers of reasoning and visualization, furnishes you with an invaluable background for your later study of engineering problems.



*Measurement of X-Ray Dose in Tissue-Like Material with the Betatron*

## Department of Theoretical and Applied Mechanics

This is the other department which offers courses required by all the degree-granting departments. The purpose of the courses is to train you in analyzing and solving engineering problems by applying the principles of mathematics and mechanics to the design, construction, and operation of structures and machines.

In the laboratory work, which is given in conjunction with the classroom instruction, you test many materials — steel, brass, aluminum, wood, and concrete. The results of your tests show up the various properties possessed by these materials, and form the basis for determining which materials can be used in the design and construction of engineering equipment. They also serve as the basis for preparing the written specifications for various materials. The work you do in the laboratories is right up-to-date as far as the latest developments in testing methods and procedures go. A lot of what you study will relate to modern engineering practice involving high-speed equipment and extreme operating conditions of temperature and pressure.

In the hydraulics and fluid mechanics laboratory you perform experiments on the flow of oil and water in pipes and on the flow of water in open channels. You also study what we call the viscosity of several fluids, as well as how various pumps and turbines work. In addition, a number of advanced courses in the analysis of stresses in materials, in the testing of materials, and in hydraulics and fluid mechanics are offered as electives for your junior or senior work.

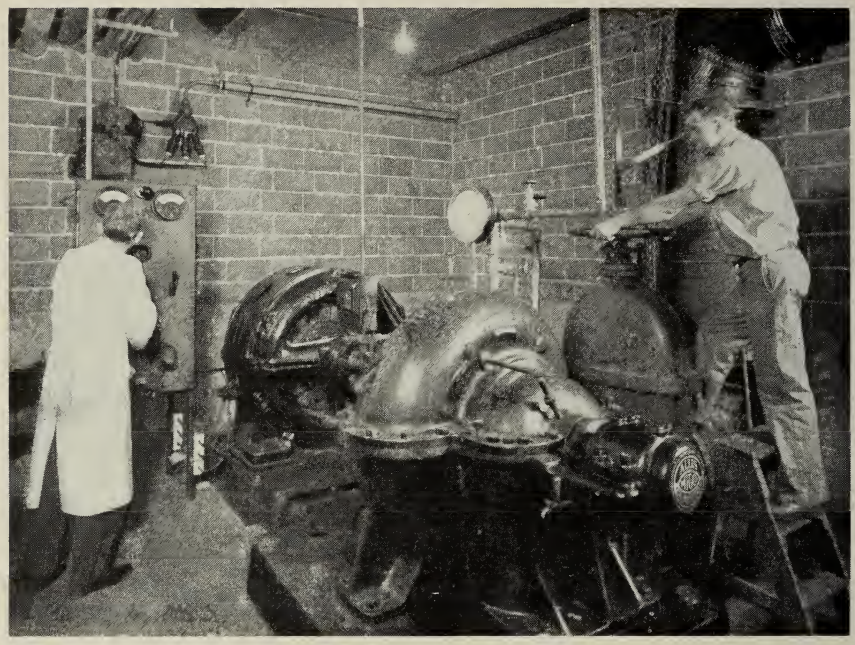
## Physics Department

The curriculum in engineering physics, administered by the physics department, is designed to give you the thorough training in fundamental physics and mathematics you'll need when you run into the increasing complexity of engineering research, development, and application. The work of the first two years is much like that in the other engineering curricula; in the last two years advanced courses in physics, mathematics, and chemistry are emphasized, but a liberal amount of time is allowed for the study of any field of engineering in which you are especially interested. The details of technical application are left to be learned in connection with a particular job; or if you pick your electives right, you can make the curriculum a basis for graduate work in some particular field of engineering or in physics.

In addition to offering the curriculum in engineering physics, the physics department also provides you with the courses in general

physics which are required of all engineering students. The department further serves the University by offering similar general physics courses to students in other colleges. For those of you who may desire additional work in physics, the physics department offers advanced courses in electricity and electronics, heat, light and optics, radiation, and nuclear physics, as well as research facilities in the numerous fields of modern physics.

*Testing Landing Gear in the Aeronautical Structures Laboratory*



*Electric-Driven Centrifugal Pump which delivers 13,500 gallons per minute*

## CURRICULUM IN ENGINEERING PHYSICS

*For the Degree of Bachelor of Science in Engineering Physics*

### FIRST YEAR

Common Program for Freshmen, except that substitution of Chem. 106 for Chem. 104 is advised.

### SECOND YEAR[1]

| FIRST SEMESTER | HOURS | SECOND SEMESTER | HOURS |
|---|---|---|---|
| German, or Approved Elective | 4 | German, or Approved Elective | 4 |
| Math. 132—Calculus | 5 | Math. 142—Calculus | 3 |
| Physics 103—General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104—General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | 1 | T.A.M. 150—Analytical Mechanics (Statics) | 2 |
| Military Science (men) | 1 | Physical Education | 1 |
| Approved Electives | 3 | Military Science (men) | 1 |
| | | Approved Electives | 3 |
| *Total* | 19 | *Total* | 19 |

THIRD YEAR[1]

| | | | |
|---|---|---|---|
| E.E. 320—Introduction to Circuit Analysis | 4 | Math. 345—Differential Equations and Orthogonal Functions[2] | 3 |
| E.E. 321—Circuit Lab. | 2 | Physics 322—Theoretical Mechanics. | 3 |
| Math. 343—Advanced Calculus[2] | 3 | Physics 342—Electricity and Magnetism | 3 |
| Physics 281—Intermediate Atomic Physics | 3 | Physics 343—Vacuum Tube Circuits[3] | 4 |
| Physics 321—Theoretical Mechanics | 3 | Physics 360—Heat, or M.E. 205—Thermodynamics | 3 |
| Physics 341—Electricity and Magnetism | 3 | Approved Electives | 3 |
| *Total* | 18 | *Total* | 19 |

FOURTH YEAR[1]

| | | | |
|---|---|---|---|
| Physics 344—Vacuum Tube Circuits,[3] or Technical Option[4] | 4 | Chem. 240—Elementary Physical Chemistry | 3 |
| Physics 371—Light | 2 | Physics 372—Light | 2 |
| Physics 373—Light Lab. | 2 | Physics 374—Light Lab. | 2 |
| Technical Option[4] | 3 | Approved Electives | 5 |
| Approved Electives | 6 | Technical Option[4] | 3 |
| *Total* | 17 | *Total* | 15 |

[1] The election of Chem. 110, 124, and 234 is advised. Students wishing to emphasize chemistry may substitute chemistry electives for E.E. 320 and 321. Students wishing to emphasize electrical engineering should elect E.E. 350 and 351, 352 and 353, and 354 and 355 in their fourth year. Students wishing to emphasize geophysics should elect most or all of their technical options in geology. Five hours must be approved non-technical courses.

[2] Math. 341 and 342, or Math. 347 and 348 may be substituted for Math. 343 and 345.

[3] Students desiring to emphasize electrical engineering may elect, if they so desire, E.E. 342 and 343, and E.E. 344 and 345 instead of Physics 343 and 344. These students should register in E.E. 350 and 351 concurrently with E.E. 342 and 343, or Physics 343; E.E. 344 and 345, or Physics 344 may be taken concurrently with E.E. 352 and 353. This allows E.E. 354 and 355 to be taken the second semester of the fourth year.

[4] Technical Options: Chem. 110, 124, 234, 241, 336, 337, 342, 343, 344, 397, 398; E.E. 330 and 331, 344 and 345, 350 and 351, 352 and 353, 354 and 355; Geology 102, 150, 246; Math. 161, 317 and 318, 327 and 328, 347 and 348, 361, 385, 387, and 388; M.E. 184, 371, 372; any courses in physics or astronomy; T.A.M. 211, 221, 223.

## Engineering Courses

Besides the curricula and courses we've just talked about, the College also offers a number of courses, called engineering courses, which have been approved by the faculty from time to time. Intended to help broaden your training, they may be taken as non-technical electives in all engineering curricula. At present these courses are:

Engineering 140 — Transportation Development
Engineering 141 — Transportation Problems
Engineering 216 — Engineering Reports
Engineering 220 — History of Engineering
Engineering 230 — Labor Relations
Engineering 239 — Industrial Relations
Engineering 292 — Engineering Law

After this description of the several departments in the College of Engineering, and of their curricula, you should have a pretty good picture of the general academic program we've set up to help you reach those scholastic objectives we talked about earlier. But if you'd like to get more complete information about any part of the whole program, drop a letter to the department you have in mind. Any one of them will bend over backwards to give you what you want.

We haven't talked about graduate work yet. If you do decide to go on for an advanced degree — a Master's or a Doctor's — you'll find that you can take the work leading up to such a degree in every one of the departments we've mentioned. The Graduate College of the University will administer your work as a whole.

Probably you shouldn't make up your mind right now about taking graduate work. It's a complicated decision to make — "Should I go right into industry and take advantage of the training courses it offers?" or "Should I stay on and do my graduate work in college?" And it's a decision that will depend a great deal on your individual needs. You'll probably be better able to make up your mind about it after you've gone through at least three years of undergraduate work. But if you are interested right now in finding out about the kind of courses and research you can take in graduate study, feel perfectly free to write either to the Graduate College of the University of Illinois, or to the department you think you'd like to take graduate work in.

# IV

# DEVELOPING YOUR PERSONALITY AT ILLINOIS

Modern design in a dairy barn saves labor, time, and money. The string represents distance travelers while doing chores.
CONVENTIONAL BARN
PARLOR TYPE BARN

# IV

## DEVELOPING YOUR PERSONALITY AT ILLINOIS

There's more to an education than just the gaining of knowledge and the developing of your mental abilities. To get along in the world, you also have to develop your personality so that you can make friends and inspire confidence among the people you work with. It would be possible to improve your personality by reading books, and studying what other successful men have done. But there's a better way, and that is to get out and mix with your fellow students, and to take part in some of the many outside-the-classroom activities that go on at the University of Illinois. Not only is this a better way — it's far more fun.

Many engineering students have to work so hard on their studies that they feel they don't have enough time to go in for parties and activities. They say you can't take part in an activity and still get top grades — there's just not enough time.

Well, no matter what grades they make, they're wrong! This attitude means that they have a false sense of values. Surprisingly enough, you'll find that if you're like most students, getting into these activities will actually help you get better grades! Why? Because you learn to study better. If you get into an activity it will take some of your time away from study, but at the same time, the experience you gain from taking part in the activity helps you to study more effectively and become a better student.

Even more important, perhaps, you get an extra advantage from these extra-curricular activities. They help to round out your school life in the same way a hobby rounds out your life later on. They give you a chance to relax from the strain and tension of your day-to-day grind of studying. A person has to have this relaxation if he's going to be happy and get the most out of his college life.

The main extra-curricular activities that you can get into in the College of Engineering are described in this section. There are, of course, many other student activities you can get into, which are on a University-wide basis, but they aren't included here because you can find out about them from other booklets the university publishes.

*Several Views of the 1949 St. Pat's Ball held in Huff Gym*

## Student Professional Societies

With the exception of the recent societies, practically all of them started out as clubs, and were later chartered as student branches by the parent national societies. The present list includes:

The Student Chapter of the American Society of Civil Engineers
The Student Branches of:
- The American Society of Mechanical Engineers
- The American Institute of Electrical Engineers — Institute of Radio Engineers
- The American Ceramics Society
- The American Society of Agricultural Engineers

The Mineral Industries Society
The Institute of the Aeronautical Sciences
Outside the College are:
The American Institute of Chemical Engineers
The Junior Branch, American Institute of Architects

More recently the student groups of the Illuminating Engineers Society, the Institute of Traffic Engineers, the Society of Automotive Engineers, and the American Foundrymen's Society have been organized on campus.

As you can see, each of these societies is related to a particular field of work. With some slight differences, nearly all of them are organized to promote interest in the parent group, to advance profes-

*Advanced Electrical Measurements Laboratory*

*The Illini Union*

sional spirit and ethics, and to provide a place for students, faculty, and eminent engineers in the field to meet. The monthly or bi-weekly meetings usually have programs featuring students or prominent speakers. Most of the societies also put on picnics, smokers, and ball games throughout the year. Membership, which is entirely voluntary, should be seriously considered any time after your freshman year.

## Honor Fraternities

In addition to the professional societies, many of the departments are also represented by honor fraternities, two of which cross departmental boundaries to include all engineers. These fraternities are:

Tau Beta Pi — all-engineering
Sigma Tau — all-engineering
Eta Kappa Nu — Electrical Engineering
Keramos — Ceramic Engineering
Pi Tau Sigma — Mechanical Engineering
Chi Epsilon — Civil Engineering
Alpha Sigma Mu — Metallurgical Engineering
Gargoyle — Architecture and Architectural Engineering.

Most of these fraternities have national affiliations and are organized primarily to recognize and promote scholarship. For this reason you have to be voted into these fraternities and consequently you need a minimum scholastic standing to be selected.

## The Engineering Council

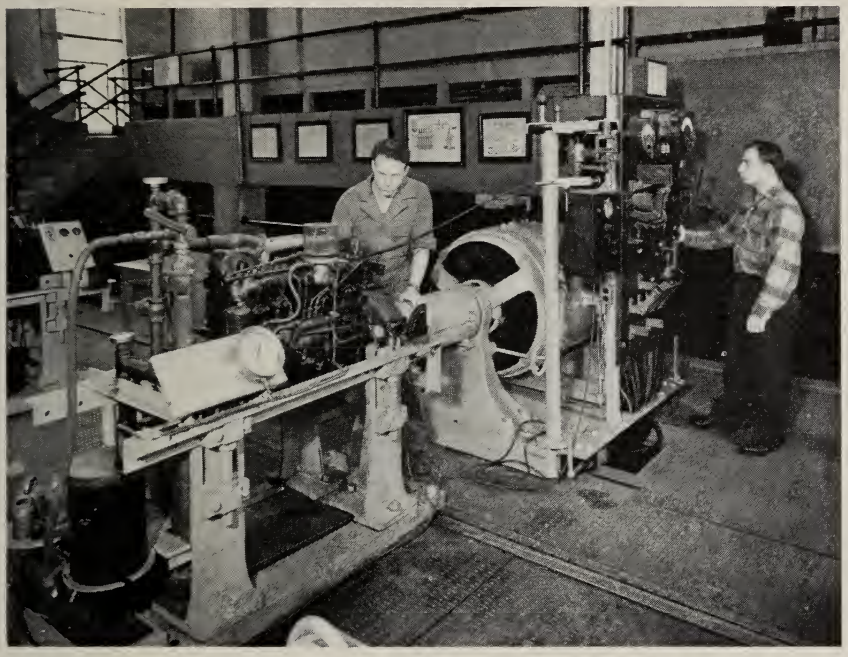
Ever since 1894, when the Association of Engineering Societies of the University of Illinois was set up, some kind of student government organization has been more or less actively in existence depending upon whether or not the students thought they needed it. The first group was made up of the three student organizations then in existence — the Civil Engineers' Club, the Mechanical and Electrical Society, and the Architects' Club.

In 1904 the Electrical Engineering Society became an independent organization. It joined the Association the following year. Five years later the Chemistry Club and the Mining Society joined the Association, which changed its name to the Engineering Societies of the University of Illinois. With only a few changes in membership the organization stayed this way until 1920.

Then it was followed by the Engineering Council, which was set up to coordinate certain engineering activities. In the main, the membership of the Council was made up of the various engineering societies, the *Illinois Technograph*, plus, later, a representative from the Illini Union. With only a few minor changes, this Council worked until about 1939, when an organization called the Illini Engineers was formed to take its place. Its purpose was about the same as the Council's, but membership in the Illini Engineers was on an individual basis rather than by societies. The Illini Engineers lasted for only part of a school year, and was never set up again. The war, of course, stopped any further attempts at organization.

But shortly after the war, during the summer of 1947, a committee of representatives from each of the professional engineering societies, and the editor and business manager of the *Technograph*, held weekly meetings to write the constitution for a new Engineering Council. This organization was ratified by the eight societies in the fall of 1947. It exists to coordinate the activities of the various societies, to promote the interest of all engineering students in extra-curricular activities, and to supervise such functions as St. Pat's Ball and the Engineering Open House. The Council consists of two members from each member society — the vice-president and an elected representative — plus the

editor and business manager of the *Technograph*. One new member society was admitted in the spring of 1948, one was admitted in the fall, and one more is requesting admission. Although the Engineering Council is not a direct student activity in which you become an individual member, its effects are readily apparent to all engineering students.



*Automobile Engine — Dynamometer Set*

## The *Illinois Technograph*

One of the foremost activities you can participate in is the *Illinois Technograph*, the technical magazine published by the students in the College of Engineering. Started in 1886 by the Civil Engineers' Club under the title *Selected Papers of the Civil Engineers' Club*, the first year's papers were published in four volumes. Volume 5 appeared in the fall of 1890 under its present title, and the Mechanical Engineers' Society helped work on it. In 1894 the publication procedure was radically changed by the establishment of the Association of the Engineering Societies, part of whose purpose was to sponsor the *Technograph* and provide an independent publication staff.

From then until about 1909 the magazine was published yearly and contained articles of high technical quality. Due to financial and other difficulties, the magazine was re-organized in that year. It appeared four times a year thereafter, with good but somewhat less technical articles, until 1918.

In 1920 the magazine was again completely revamped. The Illini Publishing Company, a nonprofit corporation organized to publish all of the University periodicals, took it over. The format was revised from pocket size to letterhead size, and they began changing the cover design with each issue. The magazine remained a quarterly until 1930, and joined the Engineering College Magazines Associated in 1923. In 1930 they began putting it out every month. And at the same time the magazine began to feature student-written articles and to give more space to news about the engineering societies. From 1934 to 1937 it was again published quarterly. The editorial policy was revised to reduce the number of technical articles and increase the news of student affairs. From 1937 to 1939 six issues were published every year. Since then eight monthly numbers have been issued each year.

Now the *Technograph* is published every month by students who serve voluntarily on the staff. Issued almost continuously since its beginning in 1886, the magazine has consistently kept up its policy of printing material prepared by the students, graduates, or faculty of the College of Engineering. This policy has given the staff members excellent editorial and business experience, and has proved invaluable in encouraging students to write technical material.

## Miscellaneous Activities

At various times in the past, engineering students have got together to put on several different types of functions. Except for the departmental affairs, these were sponsored and directed by what is now the Engineering Council. The students in the participating organizations contributed most of the ideas and did most of the work. Student engineering exhibitions, Engineers' Day, St. Pat's Ball, and departmental smokers and dinners are among this group's activities which have helped to provide the students with good fun and fellowship.

1. Student Engineering Exhibits. — The physics department, about 1906, began holding annual exhibits by the students and staff to demonstrate departmental equipment to visitors. In 1907 the first Electrical Engineering Show was held, to raise funds for a contribution to a memorial to Robert Fulton in New York City. The exhibit

went over so well with visitors that the show was held periodically up to 1942. In 1914 the first Mechanical Engineering Open House was put on by the Student Branch of the American Society of Mechanical Engineers. Skipping the years 1916 and 1918, the last open house was presented in 1919. The next year the students in the mechanical engineering department joined with those in other departments to present the first Engineering Open House. This first all-engineering exhibit was held on March 23, 1920, to commemorate the centennary of James Watt's birth. Exhibits were held in 1921 and every two years thereafter until 1941. From 1928, the Engineering Open House, or Illinois Student Engineering Exhibition as it was later known, and the Electrical Engineering Show were presented every other year until the war stopped them. Although both of these exhibits have stayed inactive because of the war and the subsequent building program, they'll probably be started again soon.

2. Illinois Engineers' Day. — The first Illinois Engineers' Day was held on March 23, 1920, along with the commemorative exercises to James Watt and the Engineering Open House. Engineers' Day exercises were then held every year from 1922 to 1925. Most of them featured an all-engineering convocation at the Auditorium, led by a parade — which in 1924 contained several elaborate floats — and usually followed in the evening by the Engineers' Dance. The convocations were held to emphasize certain significant events of engineering interest, and to promote a spirit of fellowship among the faculty and students in the various departments of the College.

3. St. Pat's Ball. — The custom of holding an annual engineers' dance was begun in 1910 and discontinued in 1916. The practice wasn't started up again until 1923, and lasted for four more years. From 1934 to 1939 they were again held annually under the title of "St. Patrick's Ball." The tradition of celebrating St. Patrick's Day with a dance in his honor was originated at the University of Missouri about 1922. According to legend, one of the engineers there found a stone bearing the inscription "Erin Go Bragh" which, loosely "translated" by its discoverer, became "St. Patrick was an engineer." This "revelation" (the story goes) definitely assured St. Patrick his place in the esteem of engineering students, and established the custom in many engineering schools of dedicating the engineers' dances to St. Patrick. St. Pat's Ball was started again in 1947 by a group of students who also indirectly pointed the way toward the setting up of the present Engineering Council. The Council then sponsored the 1948 St. Pat's Ball as one of the outstanding social events for engineering students.

4. Dinners and Smokers. — Although several smokers have been held in the past on a college-wide basis, most of them are held now as one of the meetings of the various engineering societies. Many departments also sponsor banquets for the graduating senior class, but, in the main, the dinner meetings, smokers, and other informal gatherings are sponsored by the professional and honorary societies.

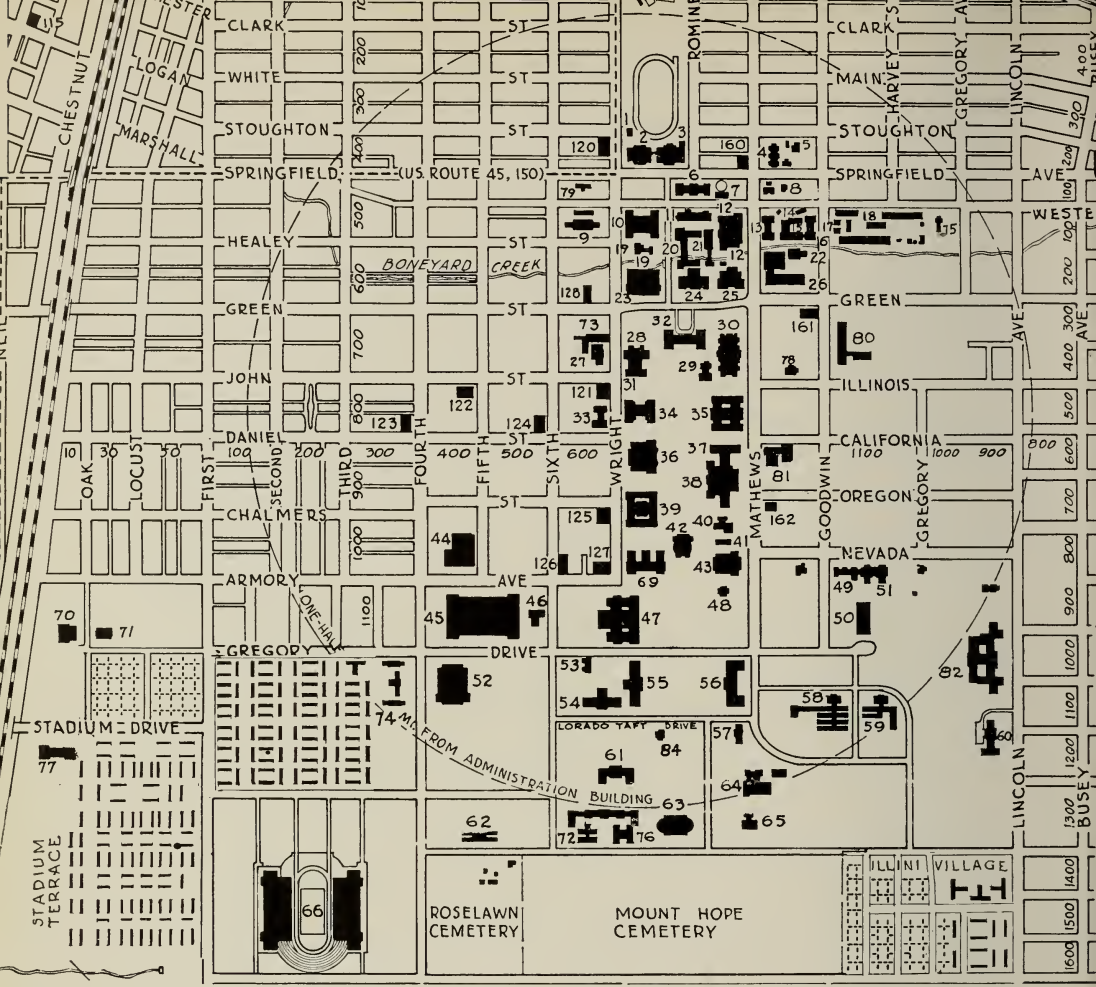
At present the engineering exhibits, all-engineering smokers, and Engineers' Day are the only functions which are still inactive. Plans are being made to re-activate the engineering exhibits; but their final success will depend largely on your individual efforts.

This discussion of the activities may have led you into thinking that they function under their own power. Of course they do not. Their success, again, depends upon how well you, as a participating student, contribute your share of effort.

These activities and others throughout the University will give you innumerable opportunities for reaching the social part of your educational objective. Only by associating with other students and with faculty members connected with these activities can you develop the broad mental outlook and personality you'll need for a successful career.

# V

# BUILDINGS AND EQUIPMENT AT ILLINOIS




# UNIVERSITY OF ILLINOIS CAMPUS

1. Radio Transmission Lab.
2. Gymnasium, Men's Old
3. Gymnasium, Annex
4. University High School
5. High School Gymnasium
6. Woodshop and Foundry
7. Filtration Plant
8. Botany Greenhouses
9. Vivarium
10. Talbot Laboratory
11. Aero. Eng. Lab. II
12. Physical Plant Service Bldg.
13. Transportation Bldg.
14. Aeronautical Engineering Lab. I
15. Mining & Metallurgical Lab.
16. Ceramics Bldg.
17. Psychological Clinic
18. Garage and Shops, North
19. North Greenhouse
20. Electrical Eng. Research Lab.
21. Electrical Engineering Annex
22. Nuclear Radiations Lab.
23. Electrical Engineering Bldg.
24. Civil Engineering Bldg.
25. Physics Building
26. Mechanical Engineering Bldg.
27. Illini Hall
28. Altgeld Hall
29. Harker Hall
30. Natural History Building
31. Mathematics Building
32. Illini Union Building
33. Davenport House
34. Administration Building
35. Noyes Laboratory of Chem.
36. Bevier Hall
37. Chemistry Annex
38. Davenport Hall
39. Lincoln Hall
40. Ag. Annex & Agron. Greenhouse
41. State Nat. History Survey Lab.
42. Auditorium
43. Smith Memorial Music Hall
44. Skating Rink
45. Armory
46. Band Building
47. Library
48. Observatory
49. Evans Hall
50. Woman's Gymnasium
51. Busey Hall
52. George Huff Gymnasium
53. Civil Engineering Surveying Bldg.
54. Architecture Building
55. David Kinley Hall
56. Mumford Hall
57. Animal Genetics Bldg.
58. Floriculture Building
59. Vegetable Crops Building
60. McKinley Hospital
61. Veterinary Pathology Lab.
62. Military Stables
63. Stock Judging Pavilion
64. Agricultural Engineering Bldg.
65. Dairy Manufactures Bldg.
66. Memorial Stadium
67. President's House
68. Horticulture Field Lab.
69. Gregory Hall
70. Abbott Power Plant
71. Geological Survey Lab.
72. Nat. Resources Bldg.
73. Arcade Building
74. Men's Residence Halls
75. Sanitary Engineering Lab.
76. Nat. Resources Garage
77. Physics Research Lab.
78. University Men's Club
79. State Water Survey
80. Student and Staff Apts.
81. East Chemistry Building
82. Lincoln Avenue Residence Hall
83. Staff Housing
84. Mumford House

# V

# BUILDINGS AND EQUIPMENT AT ILLINOIS

So far we have described what Illinois has to offer in the way of courses and curricula to help you gain knowledge and develop your mental ability, and what Illinois has to offer you in the way of activities and social life to help you develop your personality. But all the courses and curricula in the world, and all the social life you could muster, wouldn't do you much good unless you have good buildings and classrooms to work in and a tremendous amount of up-to-date equipment to work with.

The College of Engineering at the University of Illinois is able to provide you with more than adequate buildings and equipment. For example, two new buildings — for electrical engineering and for mechanical engineering — have just been completed.

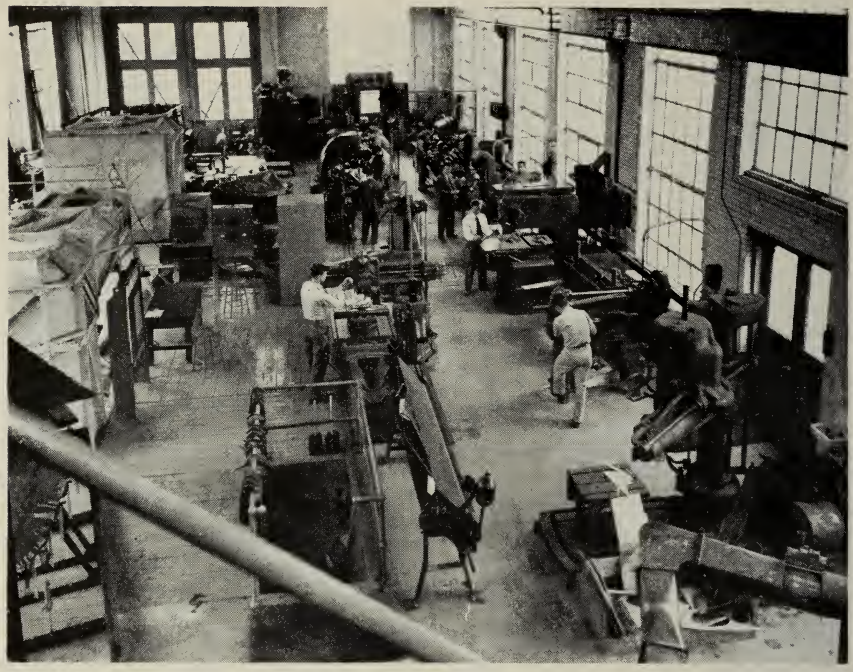
This part of the booklet will try to give you a complete picture of the buildings, laboratories, and equipment you'll be seeing and using when you come to Illinois as an engineering student. Along with this description, we're also going to describe the facilities of the architecture and chemical engineering departments, which are not connected with the College of Engineering. The numbers after the buildings mentioned in these descriptions refer to corresponding numbers on the map at the beginning of this section.

## Aeronautical Engineering

Most of the classrooms and the office of the department of aeronautical engineering share space in the Transportation Building (No. 13) with the department of general engineering drawing.

The laboratory facilities are located on the University campus and at the University of Illinois Airport. Modern equipment is available for investigating fundamental principles taught in the classroom, for demonstrating basic testing techniques, and for carrying on research.

*Aerodynamics Laboratory.* — A horizontal, return-flow wind tunnel having a 30- by 48-inch test section and an air velocity of 130 miles per hour is located in Aeronautical Laboratory I (No. 14). Additional wind tunnels for specialized investigations, and apparatus for visual observation of air flow, are installed in Aeronautical Laboratory II



*View of Aeronautical Laboratory I*

(No. 11). In the Flow Laboratory at the University Airport, a compressed air system is being installed which will supply air to a continuous flow supersonic wind tunnel and a transonic tunnel. Modern methods of instrumentation are provided for obtaining data from these tunnels.

*Aircraft Power Plant Laboratories.* — These laboratories, located in four buildings at the Airport, provide facilities for tests of aircraft reciprocating and reaction engines. Investigation of various components as well as full-scale performance testing of these engines is undertaken. In the field of reaction engines, experiments are conducted on turbojet, pulse jet, ram jet and rocket engines.

*Aircraft Structures Laboratory.* — The equipment in this laboratory is provided for the purpose of seeing how aircraft materials and airframe components act when subjected to static and dynamic loads. Modern methods of applying loads to the test specimens, and recording test data, are employed. To illustrate various types of structural design, a large variety of sample structures are available for study

and testing. These facilities are located in Aeronautical Laboratory II, on the campus.

*General Facilities.* — A well-equipped shop is provided for the purpose of constructing laboratory equipment, test specimens, and models.

To aid in demonstrating the design features and function of various aircraft components, mockups and sections of complete aircraft and parts are readily available.

## Agricultural Engineering

The agricultural engineering building, at the foot of Mathews street on the south campus (No. 64), houses some of the classrooms and all the laboratories of the department. These laboratories include space and facilities for the study of farm machinery, internal combustion engines, tractors, and home utilities; a drafting room for design work; and special research laboratories.

*One of the classes in the Farm Machinery Laboratory*

The machinery laboratory contains various types of farm machines and implements, including horticultural and dairy equipment. The tractor laboratory provides an assortment of engines and tractors, dynamometers for determining the horsepower of tractors and the requirements of power-driven machines, a motor-generator set for outside test work, an oil testing laboratory, shops, and other equipment for the study of power units. The home equipment laboratory has several types of electrically driven farm and home appliances.

The study of problems in seed cleaning and grading is carried out with equipment housed in a special air-conditioned laboratory. Another laboratory is provided with dehydration equipment for determining optimum conditions of humidity and temperature for storage or processing.

## Architectural Engineering

The department of architecture, administered in the College of Fine and Applied Arts, is located in the Architecture building on south campus (No. 54). This building contains ample drafting rooms, classrooms, and freehand studios for conducting the work in both architecture and architectural engineering. In this building also are the department offices and the famed Ricker Library of Architecture, which occupies the second floor of the north wing. Included in the library's collection are 22,072 volumes on architecture, architectural engineering, and the allied arts; 20,714 lantern slides and 23,114 mounted photographs and drawings; 12,884 clippings; and 1378 pamphlets. One of the largest architectural libraries in the world, it contains technical literature published in many foreign languages.

## Ceramic Engineering

Most classrooms, the department offices, the museum, the library, and the general ceramics laboratories are in the Ceramics Building (No. 16). The other special laboratories are right next to it in the Ceramics Laboratory (No. 15).

*Museum.* — Most of the departmental museum specimens exemplify the engineering phases of ceramics. In addition a collection of about 200 objects, showing what a big field ceramic art is, has been acquired through purchases and gifts. These include representative pieces from both American and foreign potteries.

*Ceramics Library.* — The departmental library contains about 2,500 volumes restricted to ceramics and those parts of the physical

and chemical sciences which are important in its study. Additional and current sources of ceramic information are the 36 periodicals and journals to which the department subscribes.

*General Ceramics Laboratories.* — The laboratory courses in raw materials, body glazes, and enamels are conducted on the first floor of the Ceramics Building, and provide facilities for 60 students. The laboratories contain all the apparatus and equipment usually required for the grinding and pulverizing of materials so that pottery, glasses, glazes, and enamels may be studied for physical properties, and tested.

*Pottery Laboratory.* — The pottery laboratory is used for instruction in the preparation of body mixtures, for demonstration and practice in the various methods of pottery production, and for the making of special articles used for class and research work. The shop for demonstrating the making of plaster molds, and for jiggering, casting, or pressing various pottery wares contains jollies, layout tables, whirlers, and lathes.

*Kiln Laboratory.* — This laboratory, 100 by 42 feet, houses the semi-plant and plant-size equipment, kilns, and furnaces. The eight oil- and gas-fired kilns range in capacity from 5 to 50 cubic feet and provide temperatures up to 3000 degrees F. Two 60-pound batch, rotary enamel smelters, and 8 pot-type and cone-fusion furnaces, supplementing the larger ones, are used for special purposes or higher temperatures. Three electric furnaces, with hearths ranging up to about 2′ x 2′ x 3½′ inside, are used for special firing. All furnaces and kilns are wired for thermocouples to a control room where automatic pyrometric equipment is located.

*Enamel Laboratory.* — This laboratory, designed for instruction and research in all branches of vitreous enameling, is completely equipped for the chemical cleaning and pickling of sheet iron and the sandblasting of cast iron. Furnaces for the smelting of all types of enamel are available, including nine gas-fired crucible pot furnaces, two high-temperature electric pot furnaces, one tank-type gas-fired furnace, and two rotary furnaces of the ordinary commercial type. The extensive related apparatus includes some of the most modern equipment for dipping and spraying.

The enamels are fired in six electric furnaces — five of the chromel resistance type and one containing a special high temperature alloy — all controlled by automatic recording control pyrometers. The furnaces cover a wide range of sizes, the largest having a chamber 24″ x 24″ x 40″. The testing equipment includes a Hunter Multipurpose Reflec-

tometer and a Photovolt Reflectometer, the G.E. Thickness Gage and the Magna Gage, the Bureau of Standards Gage machine, and impact equipment, binocular and ultrapac microscopes, and other miscellaneous apparatus. A recording Spectrophotometer, a spectroscope, and complete x-ray equipment are also available.

*Ceramic Materials Laboratory — Examination and Testing of Raw Materials, Bodies, and Glazes*

*Structural Clay Products Laboratory.* — A part of the floor space in the kiln laboratory is utilized for machinery equipment. There is installed a brick-making unit with pug mill, auger machine, and hand-operated cutter. A smaller auger machine for making tiles and bars, a small de-airing unit, a Simpson mixer, a 7- by 10-inch jaw crusher, 5-foot dry and wet pans, a hand-power saggar press, a hand-power repress, a 50,000-pound capacity hydraulic press, smaller plunger presses, and a dryer complete the equipment of this laboratory.

*Drying Laboratory.* — Experiments in the drying of clay products and studies of the fundamental principles involved in drying are conducted in a drying cabinet with forced air circulation and automatic control of temperature and relative humidity.

*Microscopy Laboratory.* — The petrographic microscope equipment includes instruments with complete accessories for both instruction and research. Three binocular miscroscopes, a dark field parabaloid

condenser, a cardioid condenser, a camera for taking photomicrographs with lens attachments for macrophotography, and thin-section cutting apparatus constitute some of this equipment. There is a large collection of minerals, ceramic raw materials, ceramic wares including refractories illustrating the effects of service in glass melting and other furnace operations, and specimens of faults found in defective glass. The equipment is sufficiently extensive and is so chosen so that you can study particles of all sizes falling within the whole range of optical visibility.

*Research Laboratories.* — Research is an important function of the department, and excellent equipment is provided in several laboratories reserved for research purposes. For investigations which must be conducted at high temperatures, a variety of furnaces capable of close temperature regulation, and some with atmospheric control, are available. In addition, there are available a super-centrifuge, a colloid mill, and Fizeau-Pulfrich interferometers.

## Chemical Engineering

The classrooms and laboratories of the chemical engineering division of the Department of Chemistry are located in the new East Chemistry Building (No. 81). They occupy approximately 65,000 square feet (mainly on the first three floors) and contain some of the finest facilities available anywhere for instruction and research in this field.

*Unit Operations Laboratory.* — The heart of the building is the unit operations laboratory, which occupies 13,500 square feet of floor space. Extending through three stories, the laboratory provides operating balconies for tall equipment at 9-, 18-, and 27-foot levels. The equipment has been especially designed for instructional purposes. It consists of a distillation column, an all-purpose evaporator, an extraction column, dryers, thickeners, filtration equipment, and units for the study of heat transfer and flow of fluids. An overhead crane is available for handling the heavy equipment.

*Unit Process Laboratory.* — The somewhat smaller unit process laboratory extends through two stories and contains the necessary autoclaves, kettles, and distillation towers to conduct process development work. The laboratory is equipped with heavy pipe racks for supporting large apparatus, and has a central control panel for automatic control and recording of pressures, temperatures, and rates of flow.

*High-Pressure Laboratory.* — Located on the first floor, this laboratory contains equipment for studying the physical properties of gases and liquids and for chemical reactions at pressures up to 15,000 pounds per square inch. Facilities for extreme high pressures up to 3,000 atmospheres will be mounted in a protected recess in the floor. This laboratory also contains automatic control and recording instruments on a central panel.

*Electro-Chemistry Laboratory.* — A large laboratory on the first floor is provided with the necessary vats and electrical equipment for electro-chemical operations. The laboratory also contains a small-scale industrial electro-plating plant. A motor generator set in an adjacent room supplies d.c. power for this laboratory and the rest of the building.

*Boiler-Water Research Laboratory.* — The study of boiler-water conditioning for the prevention of corrosion, embrittlement, and deposits is carried on in this laboratory. It contains high pressure boilers, water treating units, and control and analytical devices.

*Pilot-Plant Laboratory.* — This laboratory, on the fourth and fifth floors of the building, contains facilities for the development of commercial-scale chemical processes and for special large-scale research projects. It has two balconies for operation of tall equipment and is complete with control and metering devices and analytical facilities.

*Measurements and Instrumentation Laboratory.* — This laboratory contains apparatus for studying the methods used in measuring pressure, temperatures, rates of flow, and liquid levels and for controlling and recording these quantities. A process unit designed for automatic control is also installed.

*Miscellaneous Facilities.* — Right next to the unit operations laboratory are rooms containing a refrigeration system, a low temperature room, high-capacity air compressors, and furnaces. The latter include gas, electric resistance, and induction type units.

A large drafting room for a senior course in chemical plant design is located on the second floor.

Other facilities include a constant temperature and humidity room, a large grinding and crushing laboratory, two machine shops — one for construction and maintenance personnel and one for students and faculty — a 200-seat lecture room with projection booth, a small departmental library, a seminar and student clubroom, a locker and shower room to permit students to change clothes for laboratory work, and ample ventilation machinery in the basement and penthouse of the building to remove objectionable odors from the laboratories.

## Civil Engineering

Except for those in surveying, sanitary engineering, and hydraulic engineering, the laboratories in the department of civil engineering are located in Talbot Laboratory (No. 10). This building is an outstanding one of its kind in the country. It is shared with the department of theoretical and applied mechanics, and has 82,000 square feet of floor area and assembled equipment. Most of the classrooms and drafting rooms, and the department office, are in the Civil Engineering Building (No. 24).

*Surveying Laboratory.* — The equipment and facilities for work in surveying are housed in a separate building (not shown on the map) on the south campus, near the practice areas. Numerous transits, levels, plane tables, tapes and smaller instruments are available for regular surveying practice, geodetic surveying, and photogrammetry. Several instruments of high precision are provided for advanced work. There are enough instruments and supplemental equipment to take care of approximately 30 transit parties, 30 level parties, and 10 plane-table parties at one time.

*Summer Surveying Camp.* — The University leases from the U.S. Forest Service a large camp in the Chippewa National Forest in northwestern Minnesota, about 25 miles northeast of Bemidji. The camp is near the headwaters of the Mississippi River in a secluded region with topography ideally suited for practice in plane, topographic, and route surveying with numerous lakes and streams for hydrographic surveying. The 17 large buildings there are on high ground between two small lakes and are one-half mile from Lake Rabideau, which is 2½ miles long. The buildings have a total floor area of 25,000

*Scene from Summer Surveying Camp in Northwestern Minnesota*

*Summer Surveying Camp Scene*

square feet and are large enough to take care of feeding and housing 150 students and 15 faculty members. The facilities also include drafting rooms, classrooms, a library, a recreation room, a small infirmary, and several service buildings. The nearby lakes offer excellent opportunities for swimming, canoeing, and fishing; the surrounding forest area attracts men interested in hiking; and there are playing fields for outdoor games. As a civil engineering student you spend eight weeks at the camp during the summer between your freshman and sophomore years. Instruction and field practice will fill your normal working day, but plenty of time remains for recreation.

*Cement and Concrete Laboratory.* — Modern equipment is available in this laboratory for making the standard tests on Portland and other cements, and also for tests and research on plain concrete. Storage bins, screens, scales, mixers, moist rooms, and a low-temperature unit comprise the equipment used for studying the effect of materials, proportions, temperatures, and other factors on the character and strength of concrete.

*Soil Mechanics Laboratory.* — These laboratories contain the equipment necessary to perform all the common tests for identifying and classifying soils and for investigating their mechanical and hydraulic properties. Moist rooms, freezing chambers, and special equipment are available for research. The laboratory also has many types of devices used in the field for measuring earth and water pressures and for making soil explorations.

*Bituminous Materials Laboratory.* — This laboratory contains the usual facilities for tests and research in asphalts, tars, and similar

materials used in building construction, road building, and similar construction work.

*Non-Bituminous Materials Laboratory.* — This laboratory contains the usual installation of rattlers, abrasion and impact machines, ovens, and other equipment needed for the tests and research on paving brick, building stone, concrete aggregates, and stone and gravel used in road building.

*Wood Laboratory.* — The wood laboratory is equipped for the various tests of wood specimens, and for testing and research on joint-connected wood structures.

*Sanitary Engineering Laboratory.* — This modern and well-equipped building (No. 75) has a floor area of 5,000 square feet and provides classrooms, offices, and laboratories for instruction and research in sanitary engineering. Four large tanks 10 feet in diameter, two of which are 16 feet high and two 28 feet high, are an important feature. These tanks are intended mainly for the primary treatment of sewage in preparation for use in research, for the collection of fresh sludge and well-digested sludge, and for the generation of gas through the digestion of sewage solids. Sewage is supplied by a connection with the main city outfall sewer adjacent to the building.

*Hydraulic Engineering Laboratory.* — Under a cooperative agreement with the State Water Survey, civil engineering students may make use of the hydraulic engineering laboratory that will be included in the State Water Survey Building for which funds were appropriated in 1945. This laboratory will be equipped with necessary facilities for investigations of river flow and spillway capacities, underground flow,

*Summer Surveying Camp Scene*

soil erosion, various hydraulic aspects of pump corrosion, and other factors concerned with the control and use of water. At present the hydraulic engineering facilities are located in the Sanitary Engineering Laboratory.

*Drafting and Design Rooms.* — The department has at its disposal eight large drafting rooms for junior and senior students in design work. Each student is able to have his own desk for work at any time.

*Structural Research Laboratory.* — The structural research laboratory has been designed and equipped for testing and research on large structural members and whole structures in steel or concrete, as distinguished from investigations of the physical properties of materials. Much of the equipment is especially designed for tests of particular members or structures. Some outstanding installations of this type are: the equipment used in the tests of multiple-span, reinforced concrete arch bridges having an over-all length of about 100 feet and a height of 35 feet; two 200,000-pound fatigue testing machines for subjecting joints in structural members to repeated and reversed loads; and tension machines for subjecting structural members to high-speed loading.

The main laboratory, which is shared with the department of theoretical and applied mechanics, is 40 feet wide by 147 feet long, occupying the central part of the building to its full height. It is served by a 10-ton crane 50 feet above the floor. This laboratory, in addition to having a heavily reinforced floor for testing structures that require special apparatus, contains an Emery-Tatnall testing machine of 3,000,000-pound capacity, a 600,000-pound Riehle testing machine, and a number of other relatively large, standard testing machines. A second laboratory, also shared with the department of theoretical and applied mechanics, is 24 feet wide by 147 feet long by two stories high and is served by a crane 16 feet above the floor.

## Electrical Engineering

The office, classrooms, and most of the laboratories of the department of electrical engineering are located in the new Electrical Engineering Building (No. 23), one of the most recent additions to the campus. Situated prominently on the northeast corner of Wright and Green streets, this new building contains the latest equipment and appointments designed for efficient study conditions.

*Electronics Laboratory.* — This laboratory is well equipped for experimental work in the highly important and rapidly developing

field of electronics. The apparatus includes the latest types available for the study of industrial applications of electronics, including resistance welding controls, high frequency heating, and industrial electronic controls.

*Radio Laboratory.* — In addition to the usual equipment for instruction in the principles of radio communication, the radio laboratory is provided with high and ultra-high frequency transmitters and receivers, television transmitting and receiving equipment, radio-frequency standards, and full equipment for making radio frequency measurements and investigations, including those on radar and other ultra-high frequency apparatus.

*Radio Design Laboratory.* — The object of this laboratory is to bridge the gap between classroom theory and design practice. By actual construction and measurement you can verify for yourself the principles of design relating various components of radio circuits.

*Communication Laboratory.* — This laboratory contains an artificial long transmission line, twelve miles of cable circuit, and many pieces of special equipment used by students in their experimental studies of circuits and lines at telephone frequencies.

*Dynamo Laboratory.* — The dynamo laboratory contains a large assortment of electric generators, motors, and transformers together with auxiliary equipment and special devices used by junior, senior, and graduate students in their experimental studies. The equipment permits tests over a wide range of current, voltage, and frequency.

*The Electrical Machinery Laboratory can accommodate ten classes at one time*

*High Voltage Laboratory.* — This laboratory is located in the south end of the Electrical Engineering Annex (No. 21). The equipment includes generators with either continuous or alternating potentials for the study of high voltage phenomena and a special generator of moderate capacity for surge testing.

*Illumination, Photometry, and Colorimetry Laboratories.* — These laboratories, which partly occupy the north end of the Electrical Engineering Annex, contain dark rooms and equipment for photometric studies. In addition complete apparatus makes this laboratory outstanding in the field of colorimetry. In the new Electrical Engineering Building is a demonstration room with a seating capacity of about 100 persons. The up-to-date equipment of this room permits excellent demonstration of illumination principles.

*Servomechanism Laboratory.* — Containing amplidynes and rototrols necessary for basic servomechanism study, this laboratory also provides hydraulic servomechanisms, a servomechanism analogy computer, and other control devices for advanced work.

*Calibration Laboratory.* — This laboratory contains primary and secondary standards, including standard cells, resistances, potentiometers, and other devices necessary for maintaining the accuracy of the various types of electrical instruments used in experimental work. The instruments used in the various laboratories are checked regularly in this laboratory.

*Meter and Relay Laboratory.* — The equipment in this laboratory includes standard and special apparatus for studying the performance of watt-hour meters, protective relays, and other devices used in the recording of electrical energy and the protection of power transmission and distribution systems.

*Hobby Laboratory.* — This laboratory represents one of the extracurricular activities supported by the department of electrical engineering. It will provide an opportunity for ingenious students to build apparatus of their own fancy, such as radios, camera timers, and small motors. Its facilities include work benches, power tools, and test equipment.

*Research Laboratories.* — These laboratories occupy the Electrical Engineering Research Laboratory (No. 20) and are used in connection with the Engineering Experiment Station activities of the department, as well as for research work by graduate students and special investigations by members of the department staff.

The fields of investigation covered by these laboratories are many and diverse. They include the design of klystrons and magnetrons, photoelectric and infra-red phenomena, antenna measurements, ultra-high frequency measurements, high-voltage testing of power apparatus, arc welding, meter and relay measurements, photometry, colorimetry, servomechanisms, and electric power machinery.

The equipment in these research laboratories has kept step with the rapid advances of the investigations. It includes such items as complete facilities for the manufacture of all types of vacuum tubes, an automatic recording spectrophotometer, a monochromator, surge generators, antenna towers, and a complete machine and woodworking shop for the construction and repair of experimental apparatus.

## Civil Engineering Building

Foremost among the buildings on the engineering campus is the Civil Engineering Building, formerly known as Engineering Hall (No. 24), which was built in 1893 and which, during registration each semester, serves as the starting point for all engineering students. Containing the drafting rooms and office of the civil engineering department, as was mentioned previously, the building also provides space for the Engineering Library which occupies the first and second floors in the central part of the building. The office of the *Illinois Technograph* is on the second floor. The office of the Dean of the College of Engineering is on the first floor, but your contact will be mainly with the Associate and Assistant Deans, whose offices are on the third floor.

## The Engineering Library

The Engineering Library occupies the first and second floors of the central wing of the Civil Engineering Building. It contains 53,000 volumes including books, bound volumes of magazines, and publications of engineering societies. It has also a large collection of pamphlets, lantern slides and manufacturers' catalogs — including "Catalog Studies" — which is kept up to date by subscription. Over 550 technical magazines and publications of engineering societies are currently received. It has a good collection of biographies of engineers and of early books on engineering. Its collection of early books on mechanics and strength of materials, on railways, and on telephone and telegraphy is considered among the best in the country. It has a collection of books for general reading, such as "Engineering Fiction," popular books in science, and books on vocational guidance along engineering

lines. This collection includes all of the books on the "Reading List for Junior Engineers" prepared by the Engineers' Council for Professional Development.

The Library has an excellent collection of general technical dictionaries in foreign languages with definitions in English, as well as similar dictionaries in special fields of engineering. It has most of the engineering publications of state, federal and foreign governments. Each year, important books and sets on engineering in both foreign languages and English are added. The Ockerson Collection of Books on River Improvement, which was a part of the private library of the late John A. Ockerson, was presented to the University in 1924, and is housed in the Engineering Library.

The all-college library is supplemented by several departmental libraries of a scientific and engineering nature. Notable are those in Ceramics and Ceramic Engineering, Chemistry, Physics, and Mathematics. In addition, much engineering material is located at the main University Library, which contains over two million volumes.

To aid users in their reference and research work, the Engineering Library has complete sets of important indexes to periodical literature such as the Engineering Index, the Industrial Arts Index, indexes to individual sets of engineering magazines, publications of engineering societies, and other series. It has complete sets of the more important abstracts such as Chemical Abstracts, Science Abstracts, and digests covering the literature of many of the divisions and subdivisions of the fields of engineering. Many other bibliographical aids are also provided by the library.

The Library contains two well-equipped reading rooms and a number of individual study tables for graduate students and faculty members.

## General Engineering Drawing

Drafting rooms and model equipment of the general engineering drawing department occupy most of the Transportation Building (No. 13), and accommodate over 2000 students. Facilities for the reproduction of drawings and printed material consist of a photostat, a large electric-driven blueprinting machine with electric dryer; Directo and Ozalid developing machines; and a standard Colts Armory printing press with type and accessories. All specifications and instruction sheets for student work are printed by means of this equipment.

In addition the pressroom houses several thousand zinc etchings on permanent mountings for printing problems used in drawing and descriptive geometry courses. The department also provides a complete collection of modern drafting equipment for both display and classroom use.

## Mechanical Engineering

The classrooms, design rooms, and laboratories of the mechanical engineering department are in three buildings on the engineering campus. The newest is the Mechanical Engineering Building (No. 26), located on the northeast corner of Green and Mathews streets. It contains several laboratories, classrooms, design rooms, and the department office. The Mechanical Engineering Laboratory Building (No. 12), across Mathews street to the north, contains many laboratories and numerous classrooms. The Foundry Building (No. 6), which occupies the southeast corner of Springfield and Burrill streets, houses only the pattern and metal castings laboratories. In the following description of the laboratories the number after the title identifies the building in which the laboratory is situated.

*One of the classes in General Engineering Drawing*

*Pattern Laboratory (No. 6).* — This laboratory provides drafting facilities for the design of all types of patterns as well as a wide variety of instructional models.

*Sand Testing Laboratory (No. 6).* — This laboratory occupies a central room and part of the basement of the building. Its equipment includes special apparatus for the grading and testing of foundry sand and the necessary benches, molds, and oven for the actual construction of sand cores.

*Metal Castings Laboratory (No. 6).* — The equipment available for instructional work in this laboratory includes various types of molding machines, a cupola for melting gray iron, a gas furnace for melting non-ferrous metals, a hardness testing machine, a transverse strength testing machine, and the necessary machinery for cleaning castings. The laboratory also provides complete apparatus for grading and testing foundry sand, as well as benches, molds, and an oven for making the sand cores.

*Mechanical Engineering Power Laboratory (No. 12).* — This laboratory houses the stationary steam and internal combustion engine

*Experimental Air Conditioning Equipment*

equipment as well as heating, ventilating, air conditioning, refrigeration, air compression, pumping and other power equipment.

In the steam-power field an oil-fired boiler is available which will generate steam at 1500 pounds per square inch and 900 degrees F, a stoker-fired heating boiler, an educational unit consisting of two turbines that may be operated in a series or parallel connection to 220 volt a.c. generators, a 100 kw turbine, a 25 kw turbine, a 100 hp steam engine, and a 25 hp steam engine.

The internal combustion engines provided are two diesel engines, one four-stroke and the other two-stroke cycle; and two single-cylinder natural-gas engines.

The heating, ventilating, and air-conditioning equipment consists of an air-conditioning unit completely covering the methods of air treatment such as heating, humidification, cooling and dehumidification. In addition unit heaters are available for testing.

The refrigeration equipment consists of a steam-driven 10-ton ammonia ice making machine, an electric-motor-driven 7.5-ton ammonia machine, and a 1-ton steam jet refrigerator.

Other equipment available includes three air compressors, a steam-driven duplex pump, two centrifugal fans, a brake tester, a belt tester, a speed reducer, fuel colorimeters, and all the instruments necessary to conduct tests on the foregoing pieces of apparatus.

In an extension of the power laboratory will be located a supersonic air and gas flow wind-tunnel with apparatus for the study of high-velocity combustion of fuels, combustion chamber design, transfer of heat to and from gases at high velocities, temperature measurement of high velocity exhaust gases, and — by means of Schlierem photography and interference patterns — the study of boundary layers and of flow distribution in ducts.

*Physical Environment Laboratory (No. 12).* — Designed to permit biological and technical research on the effect of physical environment principally upon humans, this laboratory constitutes a part of the University's Physical Environment Unit which also has laboratories located on the Chicago campus. Included in the facilities of this laboratory is an air-conditioned, low pressure chamber which permits control of the factors of physical environment — temperature, humidity, and pressure. Although this laboratory is associated with the mechanical engineering department, its services are available to all departments of the University.

*Machine Tool Laboratory (No. 26).* — This laboratory contains lathes, milling and gear-cutting machines, shapers, planers, precision

and tool grinders, drilling and boring machines, and tool dynamometers for measuring the forces exerted on lathe tools and drills when cutting metal. In addition a complete set of special tools, jigs, and fixtures is provided for demonstrating the methods used in a modern production shop.

*Welding Laboratory (No. 26).* — Equipment for alternating- and direct-current electric arc welding is furnished by this laboratory, along with facilities for electric resistance welding, acetylene and atomic hydrogen gas welding, and an automatic welding machine. Associated equipment includes machinery for preparing the metal surface before actual welding, metallizing equipment, and an automatic flame-cutting machine. Instruments are also provided for testing welds.

*Heat Treatment Laboratory (No. 26).* — This laboratory contains such basic equipment as gas and electric furnaces, a high-frequency induction furnace, and a gas carburizing furnace. Related instruments include a recording pyrometer, a tensile testing machine, a hardness testing machine, hardenability testing equipment, polishing and etching apparatus, and microscopes for studying the structure of metals.

*Metal Cutting Laboratory (No. 26).* — This laboratory is equipped with a heavy-duty lathe for research on single-point tools, a heavy milling machine for studies on milling machine operations involving cemented carbide tools, a cylindrical grinding machine, a heavy drill press, and grinding equipment for single-point tools, milling cutters, and drills. Auxiliary equipment includes a Tukon hardness tester for fine hardness measurements, a tool force dynamometer of high sensitivity, a drill dynamometer, a profilometer for measuring surface roughness, electric strain gage equipment, an arrangement for the evaluation of metal cutting temperatures, and equipment for the colorimetric determination of chip temperatures.

*Motion and Time Study Laboratory (No. 26).* — Equipped with photographic and projection apparatus for visual instruction, the motion and time study laboratory also provides stop watches, timing devices, assembly equipment, and other aids for the study of work methods and output standards.

*Gage Calibration Laboratory (No. 26).* — Containing complete instruments for the checking of inspection gages and devices, this laboratory has Johannson gage blocks, super-micrometers, projection comparators, optical inspection dividing heads with cam checking

comparators, annular and spur gear testers, and several other types of precision measuring instruments.

*Internal Combustion Engine Laboratory (No. 26).* — This laboratory contains ten dynamometers for engine testing. Three are used for testing automobile engines, two for testing high-speed diesel engines, one to drive a centrifugal supercharger so that the performance characteristics may be determined, and four for graduate study and research. All units are capable of operating at speeds up to 6000 rpm.

The laboratory is also equipped with complete instrumentation including electronic equipment for determining vibration characteristics, pressure changes, and combustion and detonation phenomena. Engine accessories such as pumps, fuel injectors, generators, and ignition systems may be tested by means of special equipment designed for the purpose.

Among the four dynamometer units for research and graduate studies are one Waukesha single-cylinder supercharged gasoline engine and one Waukesha single-cylinder supercharged diesel engine, both so arranged that the compression ratio may be changed while in operation. These units are used for fuel testing, supercharging effects, and determination of effects of change in compression ratio. One 250-hp dynamometer is connected to a Continental 6-cylinder air-cooled aircraft engine which is so arranged that intake and exhaust pressures may be changed to stimulate altitude conditions of from 1000 feet below sea level to 20,000 feet above sea level; the intake air temperature can be varied from −40° F to +150° F. One 150-hp dynamometer is connected to a Waukesha universal test crankcase to which may be attached numerous sizes of engine cylinders for the purpose of determining cooling characteristics, combustion chamber effects, and fuel performance. A small gas turbine built from a turbo-supercharger is so arranged that turbine, compressor, and burner characteristics may be determined.

*Machine Design Laboratory (No. 26).* — Equipped with a wide variety of testing apparatus, this laboratory is intended to complement classroom design work by permitting actual laboratory tests on small machine parts. From the results of these tests the effects of good and poor design procedure can be demonstrated. Included in the test equipment are instruments for checking various features of gears, bearings, shafts, clutches, brakes, and other machine components. Outstanding among these instruments is complete photoelastic equipment for examining the stresses set up in plastic models of the parts.

*Instrumentation and Controls Laboratory (No. 26).* — The equipment in this laboratory includes not only basic instruments for measuring pressure, temperature, flow, velocity, and humidity but also two control arrangements for demonstrating flow control and thermal control involving time lag and capacity effects.

*Heat Transfer Laboratory (No. 26).* — This laboratory provides apparatus for the determination of thermal conductivities, thermal emissivities, and configuration factors and for the study of other heat transfer phenomena. Additional instruments suitable for the analysis of fuels, gases, water, and engine deposits are also provided.

*Thermodynamics Laboratory (No. 26).* — Equipped with instruments for the determination of thermal and physical properties of solid and fluid media, this laboratory also furnishes facilities for the study of high and low temperature physical and chemical phenomena and for the calibration of thermometric instruments.

Included in the apparatus for the study of steady-state and transient flow phenomena is a water table which is used to demonstrate the flow of steam or any compressible medium through a nozzle. With the table such effects as the hydraulic jump in the water caused by incorrect back pressure can be illustrated. Other fluid flow phenomena, such as those induced by heat transfer processes, can be investigated by means of equipment which utilizes the birefringent optical properties of a fluid stream containing microscopic particles, such as a Bentonite Solution.

*Fuels and Lubricants Laboratory (No. 26).* — In addition to the equipment used for testing the usual physical properties, like viscosity, this laboratory also provides special equipment for testing the performance of fuels and lubricants as they are used in engineering applications.

## Mining and Metallurgical Engineering

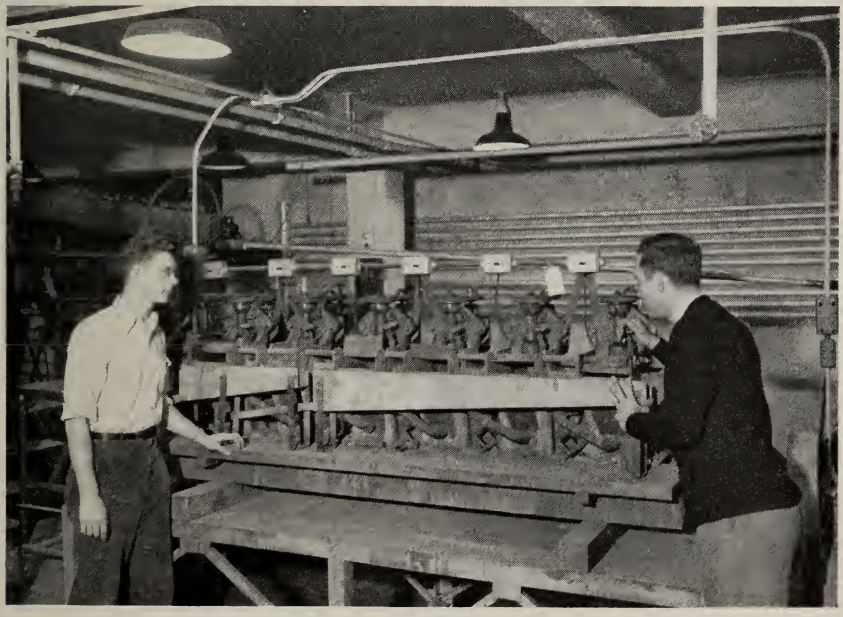
The classrooms and office of the department of mining and metallurgical engineering are in the Ceramic Building (No. 16). The laboratories are located partly in the Mining Laboratory (No. 15) which adjoins the west end of the Ceramic Engineering Laboratory, and partly in the Metallurgical Laboratory (No. 15; erected in 1936) which in turn adjoins the Mining Laboratory. In the following descriptions the numbers in parentheses after the title indicate the building in which the laboratory is situated.

*Sampling and Grinding Laboratory (No. 15).* — Complete field and

laboratory equipment is available for sampling and for the reduction of samples. The grinding room is equipped with a jaw crusher, coal grinders and pulverizers, disc-type pulverizing mills, sieve-test apparatus, a sample mixer, etc.

*Chemical and Physical Laboratory (No. 15).* — This section of the laboratory is used for control of various coal-utilization, and ore-dressing tests. Chemical equipment is available for all types of analytical work. It includes complete equipment for the proximate or ultimate analysis of coal, sulfur in coal, fusibility of ash, and the calorific value of coal. Special apparatus includes a gas calorimeter, sulfur turbidimeter, colorimetric pH comparator, combustion trains, and specific gravity apparatus for solids, liquids, and gases. Petrographic and mineral dressing microscopes are available for studying special coal and ore problems. Adjoining this laboratory is a well-equipped balance room.

*Coal Preparation and Ore Dressing Laboratory (No. 15).* — A large part of the equipment in the main laboratory is special apparatus for the testing of coal. Equipment is available for float-and-sink tests for any size of sample and any size of coal.



*Flotation Cells used in Mineral Dressing*

Apparatus or machinery of special application to coal preparation problems includes coal crushers and pulverizers, vibrating screens, wet concentrating tables, jigs, a sand-flotation unit, a centrifugal dryer, and filters. A briquetting press is also available for the making of coal briquets.

Special equipment for ore-dressing problems consists of coarse rockbreakers; rolls; pebble, ball, and rod mills; hydraulic and mechanical classifiers; magnetic separator; froth flotation units; and a large drying oven.

*Ventilation Laboratory (No. 15).* — A collection of the various kinds of miners' lights, dating from the primitive fire wheel to the modern types of flame safety lamps and approved electric cap lamps, is one of the most complete in the country. A photometer and gas-analysis apparatus, as well as gas detectors, are available for research and instruction. In addition, mine-ventilation models, fans, and a duct system comprise a very important part of the ventilation laboratory. Miscellaneous equipment consists of anemometers, sling psychrometers, katathermometers, Wahlen and Ellison gages, etc.

*Drilling and Blasting Laboratory (No. 15).* — Representative drilling machinery and accessories consists of hand and electric augers, rock drills of various types, a portable diamond drill, a gas-fired heating furnace for drill steel, and a compressed-air drill-sharpener. Dummy cartridges, squibs, fuses, electric detonators, tamping tools, blasting machines, circuit testers, and shot-firing equipment are also on hand.

*Welding Laboratory (No. 15).* — The equipment in this laboratory includes two welding booths and a Lincoln electric arc-welder, two high-speed cutoff machines, a surface grinder, fatigue machines for rotating beam and sheet specimens, Izod-Charpy tension impact machine, and Rockwell and Brinell hardness testing apparatus. Adjoining the laboratory is a specially equipped machine shop for construction of special research apparatus.

*Electrometallurgical Laboratory (No. 15).* — This laboratory is supplied with gas, air, water, and both direct- and alternating-current. It is equipped with tables, ventilating hood, voltmeters, ammeters, potentiometers, and accessory electrical equipment for instruction and experiment electrometallurgy.

*Furnace and Heat Treatment Laboratory (No. 15).* — This laboratory is equipped with six electrical resistance furnaces for heat treatment of steels, Sentry and high-temperature gas furnaces for heat

treatment of tool and die steels, a Globar sintering furnace, three gas-fired muffles for assaying of ores, and one salt-bath furnace; one 50-pound high-frequency induction furnace and one 50-pound electric-arc furnace for melting metals and alloys; two complete sets of apparatus for determining the hardenability of steels; an apparatus with attached furnace for growing single crystals of metals and alloys; and one high-speed recording potentiometer with a reaction rate of 0-3000 degrees F in two seconds. There is also a Riehle Universal 40,000-pound testing machine for experimental work. The facilities of the Talbot Laboratory (No. 10) are used for large specimens in determining the mechanical properties of metals and alloys.

*The Metallographic Laboratory (No. 15).* — This laboratory includes a grinding room and fume hood, separated from the microscope room by a glass partition. The equipment includes carborundum grinders, endless belt grinding machines, 13 wet polishing wheels, 15 metallographic microscopes (Leitz and Bausch & Lomb), large work tables, and etching equipment. In an adjoining room is located a Leitz Metallograph, a macrocamera, an apparatus for levigating polishing compound, and a film drier. There are large photographic rooms for developing and printing photomicrographs. All rooms in this laboratory are ventilated with tempered air.

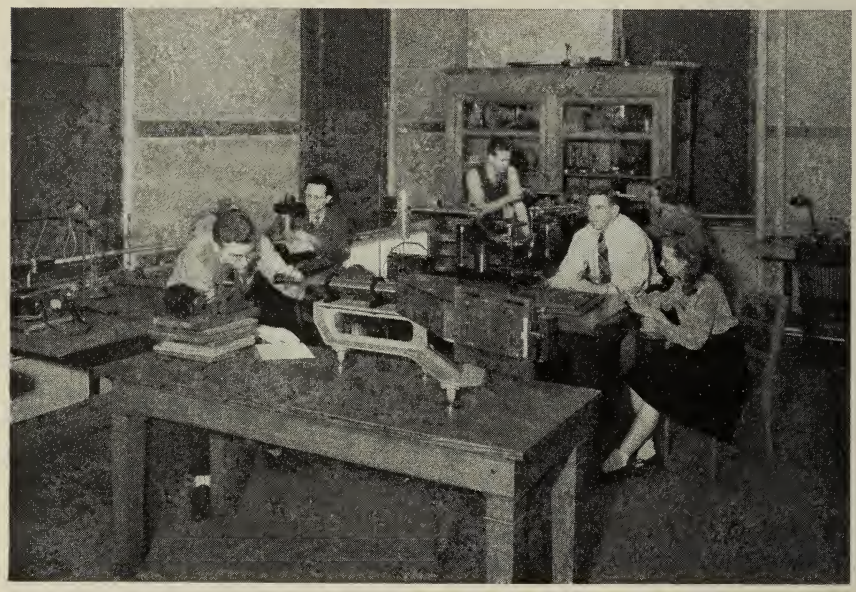
*Research Laboratories (No. 15).* — These rooms are mainly reserved for staff and graduate research work. They contain special items of equipment, such as a Zeiss Neophot metallograph and Diamo-Brinell hardness testing equipment.

## Physics Department

The Physics Building (No. 25) houses the classrooms, undergraduate laboratories, a large lecture and demonstration hall, the library, and the office of the department of physics. Some graduate and research laboratories are also in the physics building, as are a machine shop for maintenance personnel, one for students and faculty, and a glass-working shop with the service of two expert glass blowers. Facilities for instructional purposes and research include gas, direct and alternating current at several voltages, compressed air, vacuum lines, liquid air, and distilled water. In addition to these services excellent equipment is also available for investigations in optical and mass spectroscopy.

*General Physics Laboratories (No. 25).* — Consisting of three large rooms in the northwest wing of the building, these laboratories are

used for instruction in elementary physics courses. In these laboratories all engineering students learn the basic principles of physical measurement and experimentation. Conducting in the course of a year approximately 30 experiments, you are challenged by the quality of the instruments and equipment to achieve high standards of precise measurement.



*Optics Laboratory for Seniors and Graduate Students*

*Advanced Undergraduate and Graduate Laboratories (No. 25).* — One laboratory is well equipped for electrical and magnetic measurements (including work in vacuum tube circuits), another for work in light and spectroscopy, and a third for a variety of experiments in modern research methods and techniques. A laboratory is also provided for work in biophysics. Since the equipment in these laboratories is of research quality, you are encouraged to approach the experiments as research problems.

*Nuclear Radiation Laboratory.* — Located in a separate building (No. 22) this laboratory contains radium sources amounting to 350 milligrams which furnish neutrons for investigation of their interaction on atomic nuclei.

*Cyclotron Laboratory.* — The cyclotron is housed in a separate building (No. 22) adjoining the nuclear radiations laboratory. Capable

of accelerating deuterons to an energy of 10 million electron volts, the cyclotron is used to investigate the interaction of heavy particles with each other and atomic nuclei.

*Betatron Laboratory.* — Located on the south campus, the new Physics Research Laboratory (No. 77) houses the present 20-million volt and 4-million volt betatrons. It also houses the recently completed 75-million volt machine which will serve as a pilot model for the 300-million volt machine now being designed and constructed. In addition to the betatrons and associated test apparatus for investigations into the effects of accelerated electrons on atomic and subatomic particles, the building also contains a large machine shop, a glass-working shop, an electronics shop, and facilities for the maintenance and construction of the equipment.

## Theoretical and Applied Mechanics

The Arthur Newell Talbot Laboratory (No. 10) houses the classrooms, most of the laboratories, and the office of the department of theoretical and applied mechanics. Built in the form of an H, the two 50- by 187-foot four-story wings are bounded by Burrill street on one side and Wright street on the other and are joined by a 92- by 110-foot, four-story stem.

*Materials Testing Laboratories.* — These laboratories, which occupy the entire second floor of the west wing of the building, are used mainly for instruction. They contain ten testing machines with capacities of from 50,000 to 100,000 pounds, equipped with individual motor drives. The laboratories also contain a considerable number and a great variety of smaller hand- and machine-operated machines for making tests in torsion, repeated loads, hardness, impact, and effect of temperature.

*Hydraulics and Fluid Mechanics Laboratory.* — The hydraulic and fluid mechanics laboratory occupies the basement and first floor of the west wing. A standpipe 6 feet in diameter and 60 feet high, located in one corner of the laboratory, supplies the water, which is pumped into it by five centrifugal pumps from a sump in the basement. When larger quantities of water are needed, a centrifugal pump can furnish 13,500 gallons per minute. A special channel is available to handle the large flow from this pump. The weighing tanks are located in the basement; the associated scales and gages are on the first floor along with the weirs, orifice tanks, meter-testing equipment, venturi meters, centrifugal pumps, hydraulic ram, turbines,

cavitation unit, viscometers, and apparatus for demonstrating turbulent and lamellar flow and for determining Reynolds' number with both water and oil. All this equipment is used for student experiments and for investigating engineering problems in hydraulics and fluid mechanics.

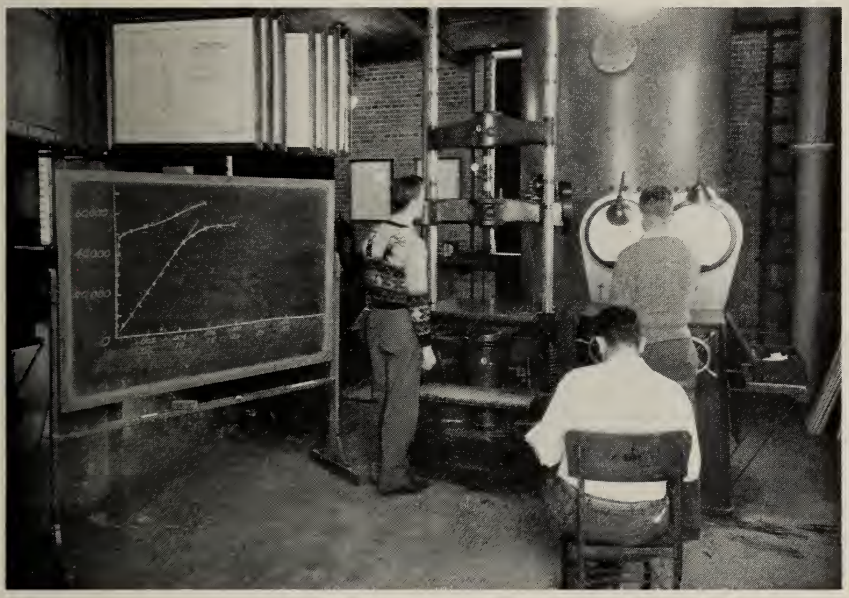
*Fatigue of Metals Laboratory.* — This laboratory, devoted to the study of the behavior of metals under repeated loading, is unusually well equipped for this purpose; it contains many repeated-stress testing machines of all types and sizes. The laboratory also contains equipment for making tests in tension, compression, hardness and impact, as well as furnaces for heat treatment of specimens, and testing equipment. Many of these machines were designed by the staff of the laboratory and were constructed in the laboratory shops.

*Vibration Laboratory.* — To supplement classroom instruction, work is done here in the vibration of machinery and structures, a field which has become of great importance due to the increase in speed of engineering parts. The laboratory contains equipment and apparatus designed to demonstrate and study the various types of vibration, the ways in which vibrations are produced, and how they may be prevented.

*Plastics Laboratory.* — The Plastics Laboratory is equipped with complete temperature and humidity control and contains machines and equipment especially designed to make standard and special tests of plastics.

*Reinforced Concrete Laboratory.* — This room, 40 feet wide by 147 feet long, occupies the central portion of Talbot Laboratory from the basement to its full height. It is served by a ten-ton crane 50 feet above the floor. Here are tested large structural and machine parts such as full-sized concrete footings, concrete bridge slabs, concrete frames and columns, and railroad rails. The laboratory contains an Emery-Tatnall testing machine of 3,000,000-pound capacity with an electric elevator, a 600,000-pound capacity Riehle testing machine, and a number of other large machines for making tests in bending, tension, compression, torsion, and impact. A special feature is the heavily reinforced floor, which is constantly in use for making special tests. The use of this testing equipment is shared with the department of civil engineering.

*Concrete Research Laboratory.* — This laboratory occupies the basement and a portion of the first floor in the southwest wing of the building. It has storage space for concrete materials and contains equipment for making plain and reinforced concrete. This equipment includes concrete mixers, a concrete saw, vibrators, drying ovens, and a refrigerating unit. Large moist rooms with temperature control provide standard curing conditions for test pieces. The laboratory is



*Testing an Aluminum Alloy to determine its strength*

served by a six-ton crane and contains the various types of machines needed for testing cement, sand, aggregates, concrete, and reinforced concrete as well as machines for making tests under impact and fatigue loads.

*Miscellaneous Laboratories.* — Several laboratories are equipped for special work — photography, metallographic investigation, photoelastic studies, and creep tests of various kinds. Each is equipped with the special apparatus needed for the various investigations, many of which are carried on in cooperation with industry.

*Machine Shop.* — In this large well-equipped shop the specimens and apparatus for student use are made; here also is made much of the research apparatus which is needed in the investigations carried on in the various laboratories.

*Car Wheel and Brake Shoe Testing Laboratory.* — Situated in a separate building, this laboratory contains a machine for testing railway car wheels and brake shoes which is capable of exerting a shoe pressure of 22,000 pounds and operating at speeds up to 100 miles per hour. It is fully equipped for measuring and recording the tangential pull of the brake shoe. This laboratory also contains a large repeated-load machine used in testing railway car wheels and axles for fatigue failures.

# VI

# WHAT HAVE YOU LEARNED?

# VI

## WHAT HAVE YOU LEARNED?

The purpose of this booklet has been to give you a picture of engineering in general, and of the kind of engineering training you can expect at the University of Illinois if you decide you want to be an engineer.

Here are the particularly important points in this booklet — the points which are worth repeating:

1. One excellent way to choose any career is to analyze yourself, analyze the job, and match the two analyses. If your characteristics and the job's characteristics seem to go together, that job might make a good career for you.
2. Engineering is not easy. At the same time, if you have the desire and the abilities to become an engineer, no career is more satisfying or important.
3. If you want to become an engineer, you should concentrate on mathematics and science courses more than on shop courses.
4. In order to become a well-rounded engineer, you should also take as many courses in subjects like economics, business administration, labor-management problems, English, and philosophy as you can.
5. The College of Engineering at the University of Illinois is especially designed to help you gain knowledge, improve your mental skills, and develop your personality so that you can become a good engineer.

This booklet, at the very least, should help you to choose your career. And if you choose engineering as a career, it should help you to know what you're getting into. Insofar as this booklet helps you, it should also help the engineering profession.

*Part of the frame for the new 300-million electron-volt Betatron*

# FAITH OF THE ENGINEER

I AM AN ENGINEER. In my profession I take deep pride, but without vainglory; to it I owe solemn obligations that I am eager to fulfill.

As an engineer, I will participate in none but honest enterprise. To him who has engaged my services, as employer or client, I will give the utmost of performance and fidelity.

When needed, my skill and knowledge shall be given without reservation for the public good. From special capacity springs the obligation to use it well in the service of humanity; and I accept the challenge that this implies.

Jealous of the high repute of my calling, I will strive to protect the interests and good name of any engineer that I know to be deserving; but I will not shrink, should duty dictate, from disclosing the truth regarding anyone who, by unscrupulous act, has shown himself unworthy of the profession.

Since the Age of Stone, human progress has been conditioned by the genious of my professional forbears. By them have been rendered usable to mankind Nature's vast resources of material and energy. By them have been vitalized and turned to practical account the principles of science and the revelations of technology. Except for this heritage of accumulated experience, my efforts would be feeble. I dedicate myself to the dissemination of engineering knowledge, and especially to the instruction of younger members of my profession in all its arts and traditions.

To my fellows I pledge, in the same measure I ask of them, integrity and fair dealing, tolerance and respect, and devotion to the standards and the dignity of our profession; with the consciousness, always, that our special experience carries with it the obligation to serve humanity with complete sincerity.

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